AFFDL-TR-76-87
Volume II - Appendix

12 b.s.

ADVANCED COMPOSITE COST ESTIMATING MANUAL

NORTHROP CORPORATION
AIRCRAFT DIVISION
HAWTHORNE, CALIFORNIA 90250

AUGUST 1976

TECHNICAL REPORT AFFDL-TR-76-87
FINAL REPORT FOR PERIOD APRIL 1975 - MARCH 1976

AIR FORCE FLIGHT DYNAMICS LABORATORY
AIR FORCE WRIGHT AERONAUTICAL LABORATORIES
AIR FORCE SYSTEMS COMMAND
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433

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This technical report has been reviewed and is approved.

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REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER: AFFDL-TR-76-87 Vol II (Appendix)	2. GOVT ACCESSION NO.
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle): ADVANCED COMPOSITE COST ESTIMATING MANUAL VOLUME II, (Appendix)	5. TYPE OF REPORT & PERIOD COVERED: Final Report 1 Apr 75 - 31 Mar 76
6. PERFORMING ORG. REPORT NUMBER	
7. AUTHOR(s): Donald J. LeBlanc, A. Kokawa, T. Bettner, J. Lorenzana, F. Timson	8. CONTRACT OR GRANT NUMBER(s): F33615-75-C-3103
9. PERFORMING ORGANIZATION NAME AND ADDRESS: Northrop Corporation, Aircraft Division, 3901 West Broadway, Hawthorne, California 90250	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS: 1207
11. CONTROLLING OFFICE NAME AND ADDRESS: Air Force Flight Dynamics Laboratory, Air Force Systems Command, Wright-Patterson Air Force Base, OH 45433	12. REPORT DATE: Aug 76
	13. NUMBER OF PAGES: 153
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	15. SECURITY CLASS (of this report): UNCLASSIFIED
	15a. DECLASSIFICATION DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Advanced Composite Materials, Detailed Parametric, Cost Estimating, Methodology

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This program concentrated on the development of a computerized system that estimates the recurring costs associated with the fabrication of advanced composite detail parts and components. The system employs Industrial Engineering Standard equations developed in the program to calculate standard hours for the detail composite fabrication operations of layup, core preparation, part consolidation and finishing. With these standards as base, recurring costs are derived through the application of variance factors, improvement curve slopes and labor rates.

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PREFACE

This Technical Report was prepared by the Aircraft Division of Northrop Corporation under Contract No. F33615-75-C-3103 for the Air Force Flight Dynamics Laboratory, Air Force Wright Aeronautical Laboratories, Air Force Systems Command, Wright-Patterson Air Force Base, Ohio. Mr. Richard J. Hirt, AFFDL/FGS is the Air Force Program Manager. This report covers the period from 1 April 1975 to 31 March 1976.

The work described in the report was carried out by Northrop Corporation, Aircraft Division, D. J. LeBlanc, Program Director. Principal contributors to the Northrop activities described in this report and their areas of responsibility are listed below:

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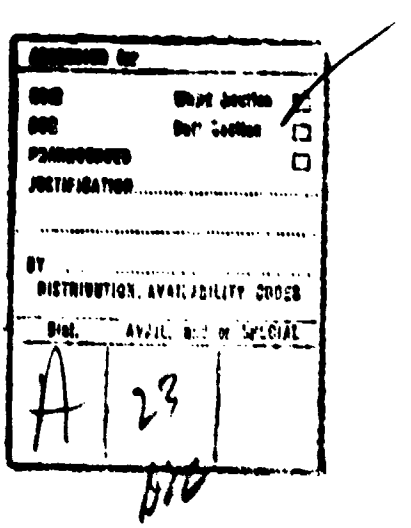

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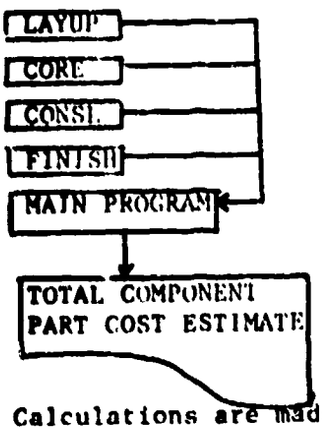
APPENDIX A. COMPUTER PROGRAM LISTING

The ACCEM computer program listing consists of a main program which calls four subroutines. Each section performs a particular function of the estimating methodology, as identified below.

FUNCTION

- FACTORY LABOR STANDARDS ESTIMATING
  - LAYUP
  - CORE PREPARATION
  - PART CONSOLIDATION
  - FINISHING
- SUPPORT FUNCTIONS ESTIMATING
- COST PROJECTION

ACCEM
COMPUTER PROGRAM



The program listing contains instructions only. Calculations are made using constants from the Permanent Input Data Sets and information from the Variable Input Data Set (keypunched from Input Forms)

```
L80:LRECL=80,    DSN=???.DATA OK FORT,    DATE = 09/10/76,    HOUR =  9.9

POSITION  ----------+---------+---------+---------+---------+---------+---------+---------RECORD---------+---------+---------+---------+---------+---------+---------+---------+
        1  C ACCFM2.FORT -- REV. 2, AUG. 1976                                                                  00000010
        2  C                                                                                                   00000020
        3  C                                                                                                   00000030
        4        DOUBLE PRECISION DAY                                                                         00000040
        5        INTEGER*4 ICD(8,2),ICD1(8,2),IEST(3),IOPT(4),IN(5)                                           00000050
        6        DIMENSION OP(60,5),PART(2,5),A(60,3),A1(60,2),R(60),S(60),SUM(5,2),                          00000060
        7       *MR(5),T1(5),T11(5,2),TN(5,3),SLP(5),SLP1(5,2),SLPB(5),                                       00000070
        8       *RTOM(10),RTOM1(10),RT1(6),RT(6),HRSL(6),FACT(8),D1(5),D2(9),D3(9),                           00000080
        9       *SLPB1(5,2),WT(3),HRSLL(6)                                                                    00000090
       10        COMMON /A/OP,SUM,R,S,PART                                                                    00000100
       11       *       /XX/A                                                                                 00000110
       12       *       /X1/COST1,WGT1,CSTSLP                                                                 00000120
       13       *       /X2/COST2,WGT2                                                                        00000130
       14       *       /X31/IN                                                                               00000140
       15       *       /X5/TN,T1,T11,SLP1,SLPB1,SLP,SLPB,MR,IUNIT                                            00000150
       16  C                                                                                                   00000160
       17  C READ IN TITLES                                                                                    00000170
       18        READ(5,1000)((OP(I,J),J=1,5),I=1,4)                                                          00000180
       19   1000 FORMAT(20A4)                                                                                 00000190
       20        READ(5,1001)(IN(I),I=1,5)                                                                    00000200
       21   1001 FORMAT(5I2)                                                                                  00000210
       22  C                                                                                                   00000220
       23        CALL DATE(DAY)                                                                               00000230
       24  C                                                                                                   00000240
       25  C WRITE TITLE SHEET                                                                                 00000250
       26  C                                                                                                   00000260
       27        WRITE(8,10000)  ((OP(I,J),J=1,5),DAY,((OP(I,J),J=1,5),I=2,4)                                 00000270
       28   10000 FORMAT('1',////T23,'ADVANCED COMPOSITE COST ESTIMATE',                                       00000280
       29       *//T22,32('-'),//T6,'ESTIMATOR:  ',5A4,T50,'DATE:  ',A8,                                      00000290
       30       *//T6,'ESTIMATE NUMBER:  ',5A4,//T6,'PART NAME:  ',5A4,                                       00000300
       31       *//T6,'PART NUMBER:  ',5A4)                                                                   00000310
       32  C                                                                                                   00000320
       33  C INITIALIZE                                                                                        00000330
       34  C                                                                                                   00000340
       35        DO 1 I=1,5                                                                                   00000350
       36        DO 1 J=1,2                                                                                   00000360
       37      1 SUM(I,J)=0.                                                                                  00000370
```

```
      WRITE(6,10001) (IN(I),I=1,5)                                          00000380
10001 FORMAT(//T2,'INPUT FORMS',T50,'QUANTITY',/T6,25('-'),T50,11('-'),/,   00000390
     *       /T6,'LAYUP',T54,I2,/T6,'HONEYCOMB CORE OPERATION',T54,I2,      00000400
     *       /T6,'PART CONSOLIDATION',T54,I2,                               00000410
     *       /T6,'FINISHING OPERATIONS',T54,I2,                             00000420
     *       /T6,'COST PROJECTIONS',T54,I2)                                 00000430
      COST1=0.                                                              00000440
      WGT1=0.                                                               00000441
      WGT2=0.                                                               00000442
      CSTSLP=0.                                                             00000443
      COST2=0.                                                              00000450
C                                                                           00000460
C                                                                           00000470
C PART I -- LAYUP                                                           00000480
C                                                                           00000490
      IF(IN(1).EQ.0) GO TO 22                                               00000500
      CALL LAYUP(IN(1))                                                     00000510
      WRITE(6,11101)                                                        00000520
11101 FORMAT(T2,'LAYUP STANDARD HOURS COMPUTED')                            00000530
C                                                                           00000540
C                                                                           00000550
C PART II -- HONEYCOMB CORE PREPARATION                                     00000560
C                                                                           00000570
   22 IF(IN(2).EQ.0) GO TO 33                                               00000580
      CALL CORE(IN(2))                                                      00000590
      WRITE(6,22202)                                                        00000600
22202 FORMAT(T2,'HONEYCOMB CORE STANDARD HOURS COMPUTED')                   00000610
C                                                                           00000620
C                                                                           00000630
C PART III -- PART CONSOLIDATIONS                                           00000640
C                                                                           00000650
   33 IF(IN(3).EQ.0) GO TO 44                                               00000660
      CALL CONSLI(IN(3))                                                    00000670
      WRITE(6,33303)                                                        00000680
33303 FORMAT(T2,'PART CONSOLIDATION STANDARD HOURS COMPUTED')               00000690
C                                                                           00000700
C                                                                           00000710
C PART IV -- FINISHING OPERATION                                            00000720
C                                                                           00000730
   44 IF(IN(4).EQ.0) GO TO 55                                               00000740
      CALL FINISH(IN(4))                                                    00000750
```

```
      WRITE(6,44404)                                                    00000760
44404 FORMAT(T2,'FINISHING OPERATIONS STANDARD HOURS COMPUTED')          00000770
C                                                                       00000780
C                                                                       00000790
   55 DO 4905 I=1,4                                                     00000800
      SUM(5,1)=SUM(5,1)+SUM(I,1)                                        00000810
 4905 SUM(5,2)=SUM(5,2)+SUM(I,2)                                        00000820
C                                                                       00000830
C                                                                       00000840
C PART V -- COST PROJECTION                                             00000850
C                                                                       00000860
C                                                                       00000870
23000 FORMAT(//T6,'FACTORY STANDARD HOURS',T40,'SET-UP',T55,'RUN',      00000880
     *       /T6,26('-'),T39,8('-'),T52,8('-'),/)                       00000890
24000 FORMAT(T6,5A4,T39,F8.3,T52,F8.3)                                  00000900
24100 FORMAT(/T6,'TOTAL HOURS',T39,F8.3,T52,F8.3,/T39,8('**'),T52,8('**'))00000910
C                                                                       00000920
C                                                                       00000930
      DO 510 I=1,5                                                      00000940
  510 READ(5,50000) (OP(I,J),J=1,5),T11(I,1),T11(I,2),SLP1(I,1),        00000950
     *              SLP1(I,2)                                           00000960
50000 FORMAT(T1,5A4,T31,F6.5,T41,F8.5,T51,F8.5,T61,F8.5)                00000970
      DO 515 I=1,6                                                      00000980
  515 READ(9,50001) (OP(I+5,J),J=1,5),ICD1(I,1),ICD1(I,2),A(I,1),A(I,2),00000990
     *A1(I,1),A1(I,2),RT1(I)                                            00001000
50001 FORMAT(T1,5A4,T25,I1,T27,I1,T31,F6.6,T41,F6.5,T51,F8.6,T61,F8.5,  00001010
     *T71,F8.5)                                                         00001020
      DO 516 I=7,8                                                      00001030
  516 READ(5,50001) (OP(I+5,J),J=1,5),ICD1(I,1),ICD1(I,2),A(I,1),A(I,2) 00001040
      READ(9,50003) (OP(14,J),J=1,5),AFACT                              00001050
50003 FORMAT(T1,5A4,T31,F8.6)                                           00001060
      DO 517 I=1,9                                                      00001070
  517 READ(9,50002) RTOH1(I)                                            00001080
50002 FORMAT(T1,F8.6)                                                   00001090
C                                                                       00001100
      WRITE(8,49100)                                                    00001110
49100 FORMAT('1',///T19,'TOTAL FACTORY LABOR STANDARD HOURS',/T19,      00001120
     *34('-'),/)                                                        00001130
      WRITE(8,23000)                                                    00001140
      DO 4910 I=1,4                                                     00001150
 4910 WRITE(8,24000) (OP(I,J),J=1,5),SUM(I,1),SUM(I,2)                  00001160
```

```
      WRITE(6,2410)SUM(5,1),SUM(5,2)                                    00001170
C                                                                       00001180
C                                                                       00001190
      IF(IN(5).EQ.0) GO TO 5999                                         00001200
C                                                                       00001210
C FOR EACH COST PROJECTION SHEET                                        00001220
      INS=IN(5)                                                         00001230
C                                                                       00001240
      DO 5900 L=1,INS                                                   00001250
C                                                                       00001260
C                                                                       00001270
C                                                                       00001280
C INPUT FOR EACH COST PROJECTION SHEET                                  00001290
C                                                                       00001300
      READ(5,50050) IUNIT,ALOT,IEST(1),IEST(2),IEST(3),ICKV             00001310
50050 FORMAT(T1,I5,T11,F7.0,T21,4I1)                                    00001320
      READ(5,50051) (IOPT(I),I=1,4)                                     00001330
50051 FORMAT(T1,4I1)                                                    00001340
      READ(5,50060)(T1(I),I=1,5),(SLP(I),I=1,5),(RT(I),I=1,6)           00001350
50060 FORMAT(T1,5(F7.2,3X),/T1,5(F7.2,3X),/T1,6(F7.2,3X))               00001360
      READ(5,50100) (ICD(I,1),I=2,6),ICD(8,1)                           00001370
      READ(5,50100) (ICD(I,2),I=2,6),ICD(8,2)                           00001380
50100 FORMAT(T1,611)                                                    00001390
      READ(5,50101) (FACT(I),I=2,6),FACT(8)                             00001400
      READ(5,50102) (HRSL(I),I=2,6),D2(8)                               00001410
50101 FORMAT(6(F7.2,3X))                                                00001420
50102 FORMAT(6F10.2)                                                    00001430
      READ(5,50103) (RTOH(I),I=1,9)                                     00001440
50103 FORMAT(6(F7.3,3X),/T1,3(F7.3,3X))                                 00001450
C                                                                       00001460
C                                                                       00001470
      DO 5005 I=1,5                                                     00001480
      DO 5005 J=1,3                                                     00001490
 5005 TN(I,J)=0.                                                        00001500
C                                                                       00001510
C                                                                       00001520
      DO 5000 I=1,5                                                     00001530
 5000 MR(I)=SUM(I,1)/ALOT+SUM(I,2)                                      00001540
C                                                                       00001550
C COMPUTE TN HOURS                                                      00001560
C                                                                       00001570
```

```
      IF(IOPT(1).EQ.1.OR.IOPT(1).EQ.2) GO TO 5120                       00001580
      IF(IOPT(1).EQ.0) GO TO 5010                                       00001590
      WRITE(6,5011)                                                     00001600
5010 FORMAT(12,'*** ERROR -- INCORRECT PROJECTION FACTOR OPTION CODE USE00001610
     *D, SET TO 0, DEFAULT VALUES USED.')                               00001620
      IOPT(1)=0                                                         00001630
C                                                                       00001640
C CURVE AND TI DEFAULT                                                  00001650
5010 CALL TND(1,5)                                                      00001660
      SLPB(2,1)=0.                                                      00001670
      SLPB(2,2)=0.                                                      00001680
      TN(2,1)=T1(2,1)+(T1(2,2)/FLOAT(IUNIT))                            00001690
      TN(2,1)=TN(2,1)*HR(2)                                             00001700
      TT=0.                                                             00001710
      DO 5100 I=1,IUNIT                                                 00001720
      TTT=T1(2,2)/FLOAT(I)                                              00001730
5100 TT=TT+TTT                                                          00001740
      TN(2,3)=(T1(2,1)*FLOAT(IUNIT)+TT)*HR(2)                           00001750
      TN(2,2)=TN(2,3)/FLOAT(IUNIT)                                      00001760
      SLPB(2)=0.                                                        00001770
      T1(2)=T1(2,1)+T1(2,2)                                             00001780
      CALL TND(3,5)                                                     00001790
      CALL TND(4,5)                                                     00001800
      ICRV=0.                                                           00001810
      GO TO 5150                                                        00001820
C                                                                       00001830
5120 IF(ICPT(1).NE.1) GO TO 5125                                        00001840
5121 ISTART=1                                                           00001850
      ISTOP=4                                                           00001860
      GO TO 5130                                                        00001870
5125 ISTART=5                                                           00001880
      ISTOP=5                                                           00001890
5130 IF(ICRV.NE.1) ICRV=0                                               00001900
      IF(ICRV.EQ.1) GO TO 5140                                          00001910
C                                                                       00001920
C UNIT CURVE                                                            00001930
      DO 5135 I=ISTART,ISTOP                                            00001940
      SLPB(I)=(ALOG(SLP(I)/100.))/ALOG(2.)                              00001950
      TN(I,1)=T1(I)*HR(I)*FLOAT(IUNIT)**SLPB(I)                         00001960
      TT=0.                                                             00001970
      DO 5135 J=1,IUNIT                                                 00001980
```

```
      TTT=FLOAT(J)**SLPB(I)                                              00001990
 5135 TT=T1+TTT                                                          00002000
      TN(I,3)=T1(I)*HK(I)*TT                                             00002010
 5139 TN(I,2)=TN(I,3)/FLOAT(IUNIT)                                       00002020
      GO TO 5150                                                         00002030
C                                                                        00002040
C CUM CURVE                                                              00002050
 5140 DO 5149 I=ISTART,ISTOP                                             00002060
      SLPB(I)=(ALOG(SLP(I)/100.))/ALOG(2.)                               00002070
      TN(1,2)=T1(I)*HK(I)*FLOAT(IUNIT)**SLPB(I)                          00002080
      TN(1,3)=T1(I)*HK(I)*FLOAT(IUNIT)**(SLPB(I)+1.)                     00002090
 5149 TN(1,1)=TN(1,3)-(T1(I)*HK(I)*FLOAT(IUNIT-1)**(SLPB(I)+1.))         00002100
C                                                                        00002110
 5150 TT1=0.                                                             00002120
      TT2=0.                                                             00002130
      TT3=0.                                                             00002140
      DO 5151 I=1,5                                                      00002150
      TT1=TT1+TN(I,1)                                                    00002160
      TT2=TT2+TN(I,2)                                                    00002170
 5151 TT3=TT3+TN(I,3)                                                    00002180
      TN(5,1)=TT1                                                        00002190
      TN(5,2)=TT2                                                        00002200
      TN(5,3)=TT3                                                        00002210
C RATE DEFAULT                                                           00002220
 5170 IF(IOPT(2).NE.1) IOPT(2)=0                                         00002230
      IF(IOPT(2).NE.0) GO TO 5200                                        00002240
      DO 5171 I=1,6                                                      00002250
 5171 RT(I)=RT1(I)                                                       00002260
C                                                                        00002270
 5200 ITEST=0                                                            00002280
      DO 5900 LL=1,3                                                     00002290
C                                                                        00002300
      IF(ITEST(LL).EQ.0) GO TO 5900                                      00002310
      DO 5210 I=1,5                                                      00002320
 5210 U1(I)=TN(I,LL)*RT(I)                                               00002330
      IF(IOPT(3).NE.1.AND.IOPT(3).NE.2) IOPT(3)=0                        00002340
      IF(IOPT(3).NE.0) GO TO 5300                                        00002350
      DO 5215 I=1,8                                                      00002360
      ICO(1,1)=ICO1(I,1)                                                 00002370
      ICO(1,2)=ICO1(I,2)                                                 00002380
 5215 FAC1(I)=A(1,1)*FLOAT(IUNIT)**A(1,2)                                00002390
```

```
C
C FIND SUPPORT LABOR UNIT HOUR FOR DEFAULT CASE
      IF(ICRV.EQ.1) GO TO 5230
C
C FOR UNIT CURVE
      IF(ICPT(1).EQ.2) GO TO 5221
      T1U=0.
      DO 5220 I=1,4
      T1UU=HR(I)*T1(I)
 5220 T1U=T1U+T1UU
      T1U=T1U/HR(5)
      BB=(ALOG(TN(5,1))-ALOG(T1U*HR(5)))/ALOG(FLOAT(IUNIT))
      GO TO 5222
 5221 T1U=T1(5)
      BB=SLPB(5)
 5222 DO 5225 I=1,6
      HRSLL(I)=0.
      AU=T1U*HR(5)*A1(I,1)
      BU=BB+A1(1,2)
      HRSL(I)=AU*FLOAT(IUNIT)**BU
      DO 5224 II=1,IUNIT
      HH=AU*FLOAT(II)**BU
 5224 HRSLL(I)=HRSLL(I)+HH
      IF(LL.EQ.2) HRSL(I)=HRSLL(I)/FLOAT(IUNIT)
      IF(LL.EQ.3) HRSL(I)=HRSLL(I)
 5225 CONTINUE
      GO TO 5237
C
C CUM AVE CURVE
 5230 IF(LL.NE.1) GO TO 5300
      IF(ICPT(1).EQ.2) GO TO 5232
      T1U=0.
      DO 5231 I=1,4
      T1UU=HR(I)*T1(I)
 5231 T1U=T1U+T1UU
      T1U=T1U/HR(5)
      BB=(ALOG(TN(5,1))-ALOG(T1U*HR(5)))/ALOG(FLOAT(IUNIT))
      GO TO 5233
 5232 T1U=T1(5)
      BB=SLPB(5)
 5233 DO 5235 I=1,6
```

```
      AU=A(1,1)*TIU*HR(5)                                                00002810
      BU=BB+A(1,2)                                                       00002820
 5235 HRSL(1)=AU*FLOAT(IUNIT)**BU                                        00002830
 5237 HRSL(1)=TN(5,LL)                                                   00002840
      D2(1)=D1(5)                                                        00002850
      DO 5238 I=2,6                                                      00002860
 5238 D2(I)=RT(I)*HRSL(I)                                                00002870
      GO TO 5315                                                         00002880
C                                                                        00002890
C FOR *NORMAL HOUR CALCULATION                                           00002900
C                                                                        00002910
 5300 HRSL(1)=TN(5,LL)                                                   00002920
      D2(1)=D1(5)                                                        00002930
 5301 IF(IOPT(3).EQ.2) GO TO 5340                                        00002940
      IF(ICD(2,2).EQ.2) GO TO 5310                                       00002950
      DO 5305 I=2,6                                                      00002960
      HRSL(I)=HRSL(ICD(I,1))*FACT(I)                                     00002970
 5305 D2(I)=RT(I)*HRSL(I)                                                00002980
      GO TO 5315                                                         00002990
 5310 DO 5311 I=2,6                                                      00003000
 5311 D2(I)=D2(ICD(I,1))*FACT(I)                                         00003010
 5315 D2(7)=COST1+COST2                                                  00003020
      IF(LL.EQ.3) D2(7)=D2(7)*FLOAT(IUNIT)                               00003030
      IF(ICD(8,2).EQ.1) D2(8)=HRSL(ICD(8,1))*FACT(8)                     00003040
      IF(ICD(8,2).EQ.2) D2(8)=D2(ICD(8,1))*FACT(8)                       00003050
      D2(9)=D1(5)*AFACT+CSTSCP                                           00003060
 5317 CONTINUE                                                           00003070
C                                                                        00003080
      GO TO 5350                                                         00003090
 5340 DO 5342 I=2,6                                                      00003100
 5342 D2(I)=HRSL(I)*RT(I)                                                00003110
      D2(1)=D1(5)                                                        00003120
      D2(7)=COST1+COST2                                                  00003130
      IF(LL.EQ.3) D2(7)=D2(7)*FLOAT(IUNIT)                               00003140
 5350 D2T1=0.                                                            00003150
      HRSLT=0.                                                           00003160
      DO 5351 I=2,6                                                      00003170
      HRSLT=HRSLT+HRSL(I)                                                00003180
 5351 D2T1=D2T1+D2(I)                                                    00003190
      D2T2=0.                                                            00003200
      DO 5353 I=7,9                                                      00003210
```

```
      5353 D2T2=D2T2+D2(I)                                                      00003220
      5400 IF(IOPT(4).NE.1.AND.IOPT(4).NE.2) IOPT(4)=0                          00003230
           IF(IOPT(4).NE.0) GO TO 5410                                          00003240
           DO 5405 I=1,9                                                        00003250
      5405 RTOH(I)=RTOH1(I)                                                     00003260
      5410 IF(IOPT(4).EQ.2) GO TO 5420                                          00003270
           D3(7)=0.                                                             00003280
           DO 5415 I=1,6                                                        00003290
           D3(I)=D2(I)*RTOH(I)                                                  00003300
      5415 D3(7)=D3(7)+D3(I)                                                    00003310
           GO TO 5425                                                           00003320
      5420 D3(7)=(D1(5)+D2T1)*RTOH(7)                                           00003330
      5425 D3(8)=D2T2*RTOH(8)                                                   00003340
           DLAB=D2T1+D3(7)+D1(5)                                                00003350
           DMTL=D2T2+D3(8)                                                      00003360
           D3(9)=(DLAB+DMTL)*RTOH(9)                                            00003370
           DCST=DLAB+DMTL+D3(9)                                                 00003380
           WT(1)=WGT1                                                           00003390
           WT(2)=WGT2                                                           00003400
           IF(LL.EQ.3) WT(1)=WGT1*FLOAT(IUNIT)                                  00003410
           IF(LL.EQ.3) WT(2)=WGT2*FLOAT(IUNIT)                                  00003420
           WT(3)=WT(1)+WT(2)                                                    00003430
      C                                                                         00003440
      C                                                                         00003450
      C                                                                         00003460
      C                                                                         00003470
           IF(ITEST.GT.0) GO TO 5600                                            00003480
      C                                                                         00003490
      C OUTPUT                                                                  00003500
      C                                                                         00003510
      C WRITE INPUT DATA                                                        00003520
      C                                                                         00003530
           WRITE(6,51000)IUNIT,ALOT                                             00003540
     51000 FORMAT('1',//T28,'COST PROJECTION',/T28,15('-'),//T6,'PRODUCTION C 00003550
          *OST ESTIMATE AT UNIT NO.:  ',I4,/T6,'AVERAGE LOT SIZE:  ',F7.0)     00003560
           IF(ICRV.EQ.0) WRITE(6,51001)                                         00003570
           IF(ICRV.EQ.1) WRITE(6,51002)                                         00003580
     51001 FORMAT(T6,'LINEAR UNIT CURVE')                                       00003590
     51002 FORMAT(T6,'LINEAR CUMULATIVE AVERAGE CURVE')                         00003600
           WRITE(6,51060)                                                       00003610
     51060 FORMAT(//T6,'PROJECTION FACTORS',T41,'T1.VAR',T51,'CURVE SLOPE',     00003620
```

```
      */T6,18('-'),T41,6('-'),T51,11('-'),/)                                    00003630
C                                                                               00003640
      DO 5515 I=1,5                                                             00003650
 5515 IF(T1(I).NE.0.) WRITE(8,51065) (OP(I,J),J=1,5),T1(I),SLP(I)               00003660
51065 FORMAT(T6,5A4, T41,F6.2,T52,F6.2,' %')                                    00003670
      WRITE(8,51070)                                                            00003680
51070 FORMAT(//T6,'LABOR RATES',T43,'$/HR',/T6,11('-'),T41,6('-'),/)            00003690
      DO 5520 I=1,6                                                             00003700
 5520 WRITE(8,51072) (OP(I+5,J),J=1,5),RT(I)                                    00003710
51072 FORMAT(T6,5A4,T41,F6.2)                                                   00003720
      IF(IOPT(3).EQ.2) GO TO 5524                                               00003730
      WRITE(8,51074)                                                            00003740
51074 FORMAT(//T6,'SUPPORT FUNCTIONS',T40,'BASE',T52,'FACTORS',                 00003750
     * /T6,17('-'),T39,6('-'),T52,8('-'),/)                                     00003760
      DO 5525 I=2,6                                                             00003770
 5525 WRITE(8,51075)(OP(I+5,J),J=1,5),(ICD(I,J),J=1,2),FACT(I)                  00003780
 5526 WRITE(8,51075)(OP(13,J),J=1,5),(ICD(8,J),J=1,2),FACT(8)                   00003790
51075 FORMAT(T6,5A4,T39,I1,T44,I1,T50,F10.2)                                    00003800
      GO TO 5529                                                                00003810
 5524 WRITE(8,51076)                                                            00003820
51076 FORMAT(//T6,'SUPPORT FUNCTIONS',T39,'DOLLARS',                            00003830
     *   /T6,17('-'),T37,10('-'))                                               00003840
      DO 5527 I=2,6                                                             00003850
 5527 WRITE(8,51077) (OP(I+5,J),J=1,5),HRSL(I)                                  00003860
 5528 WRITE(8,51077)(OP(13,J),J=1,5),D2(8)                                      00003870
51077 FORMAT(T6,5A4,T37,F10.2)                                                  00003880
 5529 WRITE(8,51080)                                                            00003890
51080 FORMAT(//T6,'OVERHEAD RATES',/T6,14('-'),/)                               00003900
      DO 5530 I=1,6                                                             00003910
 5530 IF(RTOH(I).NE.0.) WRITE(8,51081)(OP(I+5,J),J=1,5),RTOH(I)                 00003920
51081 FORMAT(T6,5A4,T41,F6.3)                                                   00003930
      IF(RTOH(7).NE.0.) WRITE(8,51082) RTOH(7)                                  00003940
      WRITE(8,51083) RTOH(8)                                                    00003950
      WRITE(8,51084) RTOH(9)                                                    00003960
51082 FORMAT(T6,'TOTAL LABOR',T41,F6.3)                                         00003970
51083 FORMAT(T6,'MATERIAL',T41,F6.3)                                            00003980
51084 FORMAT(T6,'ADMINISTRATIVE',T41,F6.3)                                      00003990
C                                                                               00004000
      ITEST=ITEST+1                                                             00004010
 5600 CONTINUE                                                                  00004020
C                                                                               00004030
```

```
      C                                                                 00004040
      C WRITE OUTPUT                                                    00004050
      C                                                                 00004060
            WRITE(6,52000)                                              00004070
52000 FORMAT('1',//T28,'COST PROJECTION',/T28,15('-'),/)                00004080
            GO TO (5601,5602,5603),LL                                   00004090
 5601 WRITE(6,52051) IUNIT                                              00004100
            GO TO 5610                                                  00004110
 5602 WRITE(6,52052) IUNIT                                              00004120
            GO TO 5610                                                  00004130
 5603 WRITE(6,52053) IUNIT                                              00004140
52051 FORMAT(T6,'UNIT COST ESTIMATE AT T',I5)                           00004150
52052 FORMAT(T6,'CUMULATIVE AVERAGE COST ESTIMATE AT T',I5)             00004160
52053 FORMAT(T6,'CUMULATIVE COST ESTIMATE AT T',I5)                     00004170
 5610 WRITE(6,52100) IUNIT                                              00004180
52100 FORMAT(/T6,'COST ELEMENT',T39,'STD. HRS',T50,'T',I5,' HRS',T65,   00004190
     *'DOLLARS',/T6,12('-'),T39,8('-'),T50,10('-'),T64,10('-'),/)        00004200
            WRITE(6,52105)                                              00004210
52105 FORMAT(/T6,'FACTORY LABOR')                                       00004220
            IF(IOPT(1).EQ.2) GO TO 5617                                 00004230
            DO 5615 I=1,4                                               00004240
 5615 WRITE(6,52110) (OP(I,J),J=1,5),HR(I),TN(I,LL),D1(I)               00004250
52110 FORMAT(T6,5A4,T40,F7.2,T50,F10.2,T64,F10.2)                       00004260
 5617 WRITE(6,52110) (OP(5,J),J=1,5),HR(5),TN(5,LL),D1(5)               00004270
 5618 WRITE(6,52120)                                                    00004280
52120 FORMAT(/T6,'SUPPORT LABORS')                                      00004290
            IF(IOPT(3).EQ.2) GO TO 5625                                 00004300
            DO 5620 I=2,6                                               00004310
 5620 WRITE(6,52125)(OP(I+5,J),J=1,5),HRSL(I),D2(I)                     00004320
52125 FORMAT(T8,5A4,T52,F8.2,T64,F10.2)                                 00004330
            WRITE(6,52127)D2T1                                          00004340
52127 FORMAT(T10,'TOTAL SUPPORT LABOR',T64,F10.2)                       00004350
            GO TO 5630                                                  00004360
 5625 DO 5626 I=2,6                                                     00004370
 5626 WRITE(6,52130) (OP(I+5,J),J=1,5),D2(I)                            00004380
52130 FORMAT(T8,5A4,T64,F10.2)                                          00004390
            WRITE(6,52127)D2T1                                          00004400
 5630 WRITE(6,52140)                                                    00004410
52140 FORMAT(/T6,'LABOR OVERHEAD')                                      00004420
            IF(IOPT(3).EQ.2) GO TO 5637                                 00004430
            DO 5635 I=1,6                                               00004440
```

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      5635 WRITE(6,52145) (OP(I+5,J),J=1,5),D3(I)                        00004450
52145 FORMAT(T8,5A4,T64,F10.2)                                           00004460
      5637 WRITE(8,52147) D3(7)                                          00004470
52147 FORMAT(T10,'TOTAL OVERHEAD',T64,F10.2)                             00004480
      WRITE(8,52150) DLAB                                                00004490
52150 FORMAT(/T10,'TOTAL LABOR',T64,F10.2)                               00004500
      WRITE(8,52160)                                                     00004510
52160 FORMAT(/T6,'MATERIAL')                                             00004520
      DO 5640 I=7,9                                                      00004530
      5640 WRITE(6,52145)  (OP(I+5,J),J=1,5),D2(I)                       00004540
      WRITE(8,52165) D3(8),DMTL                                          00004550
52165 FORMAT(T8,'OVERHEAD',T64,F10.2,/T10,'TOTAL MATERIAL',T64,F10.2)     00004560
      WRITE(8,52170) D3(9),DCST                                          00004570
52170 FORMAT(/T8,'ADMINISTRATIVE OVERHEAD',T64,F10.2,                    00004580
     *       //T10,'TOTAL COST',T64,F10.2,/T64,10('*'))                  00004590
      WRITE(8,52180)                                                     00004600
      WRITE(8,52181) (OP(1,J),J=1,5),WT(1)                               00004610
      WRITE(8,52181) (OP(2,J),J=1,5),WT(2)                               00004620
      WRITE(8,52182) WT(3)                                               00004630
52180 FORMAT(//T40,'WEIGHT',/T39,8('-'))                                 00004640
52181 FORMAT(T6,5A4,T39,F8.2)                                            00004650
52182 FORMAT(/T6,'TOTAL',T39,F8.2)                                       00004660
C                                                                        00004670
 5900 CONTINUE                                                           00004680
      WRITE(6,55505)                                                     00004690
55505 FORMAT(T2,'COST PROJECTIONS COMPUTED')                             00004700
C                                                                        00004710
 5999 WRITE(6,55555)                                                     00004720
55555 FORMAT(T2,'NORMAL ACCEM COMPLETION')                               00004730
C                                                                        00004740
 9999 STOP                                                               00004750
      END                                                                00004760
C                                                                        00004770
C                                                                        00004780
C                                                                        00004790
C                                                                        00004800
C                                                                        00004810
C                                                                        00004820
C                                                                        00004830
C                                                                        00004840
      SUBROUTINE LAYUP(IN1)                                              00004850
```

```
      DIMENSION OP(60,5),S(60),R(60),SUM(5,2),AA(15,2),AB(7,3),          00004860
     *          A(6,2),B(6,2),C(6,2),PART(2,5),IBK(4),IBK1(4),SL(3),     00004870
     *          PY(7),IPY(7),BEND2(2),IMT(2),BEND1(2),TMT(3,2),          00004880
     *          TMT1(3,2),TMT2(3,2),TMT3(3,2),CT(3,2),CT1(3,2),          00004890
     *           DEN(3,2),DEN1(3,2),WT(3,2),WTT(3,2),CST(3,2),CSTT(3,2),00004900
     *           SAM(3,2),CC(6,2),TMT2T(3,2)                             00004910
      COMMON /X/OP,SUM,R,S,PART                                          00004920
     *       /X1/COST1,WGT1,CSTSCP                                       00004930
C                                                                        00004940
C INITIALIZE                                                             00004950
      DO 21 I=1,3                                                        00004960
      DO 21 J=1,2                                                        00004970
      IMT(I,J)=0.                                                        00004980
      TMT2T(I,J)=0.                                                      00004990
      CSTT(I,J)=0.                                                       00005000
   21 WTT(I,J)=0.                                                        00005010
      TMTTT=0.                                                           00005020
      COST1=0.                                                           00005030
      CSTSCP=0.                                                          00005040
      WGT1=0.                                                            00005050
C                                                                        00005060
C READ COEFFICIENTS                                                      00005070
      DO 1 I=1,15                                                        00005080
    1 READ(1,1000)(OP(I,II),II=1,5),AA(I,1),AA(I,2)                      00005090
      DO 11 I=1,3                                                        00005100
   11 READ(1,1002) (OP(I+15,II),II=1,5),DEN1(I,1),CT1(I,1)               00005110
      DO 12 I=1,2                                                        00005120
   12 READ(1,1002) (OP(I+18,II),II=1,5),DEN1(I,2),CT1(I,2)               00005130
 1002 FORMAT(T1,5A4,T31,F8.6,T41,F8.5)                                   00005140
      DO 2 I=1,7                                                         00005150
    2 READ(1,1001)(AB(I,II),II=1,3)                                      00005160
      DO 3 II=1,2                                                        00005170
      DO 3 I=1,6                                                         00005180
    3 READ(1,1001)A(I,II),B(I,II),CC(I,II)                               00005190
 1000 FORMAT(T1,5A4,T31,F8.6,T41,F8.6)                                   00005200
 1001 FORMAT(T1,F8.5,T11,F8.5,T21,F8.5)                                  00005210
C                                                                        00005220
C                                                                        00005230
C FOR EACH LAYUP OPERATION                                               00005240
C                                                                        00005250
      DO 19000 L=1,IN1                                                   00005260
```

```
      C                                                                 00005270
            AREA=0.                                                     00005280
            BAREA=0.                                                    00005290
            PAREA=0.                                                    00005300
            R3=C.                                                       00005310
            R4=C.                                                       00005320
            R5=C.                                                       00005330
            R6=0.                                                       00005340
            S4=0.                                                       00005350
            TMTT=0.                                                     00005360
            IPY1=0                                                      00005370
            IBKD(1)=2                                                   00005380
            IBKD(2)=1                                                   00005390
            IBKD(3)=1                                                   00005400
            IBKD(4)=1                                                   00005410
            SUM1=C.                                                     00005420
            SUM2=C.                                                     00005430
            SUMT1=0.                                                    00005440
            SUMT2=0.                                                    00005450
            DO 25 I=1,15                                                00005460
            S(I)=0.                                                     00005470
         25 R(I)=0.                                                     00005480
            DO 26 I=1,2                                                 00005490
            BEND1(I)=0.                                                 00005500
         26 BEND2(I)=0.                                                 00005510
            DO 27 I=1,3                                                 00005520
            BD(I)=0.                                                    00005530
            DO 27 J=1,2                                                 00005540
            TMT1(I,J)=0.                                                00005550
            TMT2(I,J)=0.                                                00005560
            TMT3(I,J)=0.                                                00005570
            WT(I,J)=0.                                                  00005580
         27 CST(I,J)=C.                                                 00005590
      C                                                                 00005600
            DO 29 I=1,6                                                 00005610
            DO 29 II=1,2                                                00005620
         29 C(I,II)=CL(I,II)                                            00005630
      C                                                                 00005640
      C                                                                 00005650
      C                                                                 00005660
      C                                                                 00005670
```

```
      C                                                                 00005680
      C                                                                 00005690
      C READ GENERAL INFO FOR EACH PART                                 00005700
            READ(5,1100)(PART(1,I),I=1,5),(PART(2,I),I=1,5),IGT,TA,ITL, 00005710
           *             NDK,NDB                                        00005720
       1100 FORMAT(T1,5A4,T21,5A4,T41,I3,T51,F7.2,T61,I1,I2,I1)         00005730
            READ(5,1101)SAR,((SAW(I,J),I=1,3),J=1,2)                    00005740
       1101 FORMAT(T1,7(F7.2,3X))                                       00005750
            READ(5,1102) CT(1,1),CT(3,1),CT(1,2),CT(3,2),               00005760
           *              DEN(1,1),DEN(3,1),DEN(1,2),DEN(3,2)          00005770
       1102 FORMAT(T1,4(F7.2,3X),4(F7.6,3X))                            00005780
      C                                                                 00005790
      C WRITE HEADING                                                   00005800
            WRITE(8,1200)(PART(1,I),I=1,5),IGT,(PART(2,I),I=1,5),TA     00005810
       1200 FORMAT('1',///T38,'LAYUP',/T38,'------',//T6,'PART NAME:  ',5A4,T50 00005820
           *,'QTY:  ',I3,/T6,'PART NUMBER:  ',5A4,T50,'TRIM ALLOWANCE:  ',F7.2 00005830
           *)                                                           00005840
            IF(ITL.EQ.0) WRITE(8,1201)                                  00005850
            IF(ITL.EQ.1) WRITE(8,1202)                                  00005860
       1202 FORMAT(T6,'LAYUP TOOL = CURING TOOL')                       00005870
       1201 FORMAT(T6,'LAYUP TOOL NOT = CURING TOOL')                   00005880
            IF(NDK.EQ.0) GO TO 7                                        00005890
            IF(NDK.EQ.1) WRITE(8,1203) NDK                              00005900
            IF(NDK.EQ.2) WRITE(8,1204) NDK                              00005910
       1203 FORMAT(T6,'NO. OF DEBULKING OPERATION:  ',I3,               00005920
           *       T50,'TYPE OF BAG:  DISPOSABLE')                      00005930
       1204 FORMAT(T6,'NO. OF DEBULKING OPERATION:  ',I3,               00005940
           *       T50,'TYPE OF BAG:  REUSABLE')                        00005950
          7 IF(SAR.EQ.0) GO TO 9                                        00005960
            WRITE(8,1211) SAW                                           00005970
       1211 FORMAT(/T6,'AREA SEWN:  ',F7.2)                             00005980
            WRITE(8,1212)                                               00005990
       1212 FORMAT(T6,'TYPE OF SEWING',T40,'LENGTH',T53,'LAYERS',       00006000
           *       /T6,14('-'),T39,6('-'),T52,8('-'))                   00006010
            DO 8 I=1,3                                                  00006020
            IF(SAW(I,1).NE.0.) WRITE(8,1213)(OP(I+10,J),J=1,5),         00006030
           *                                 SAW(I,1),SAW(I,2)          00006040
       1213 FORMAT(T6,5A4,T39,F8.2,T52,F8.2)                            00006050
          8 CONTINUE                                                    00006060
      C                                                                 00006070
          9 CT(2,1)=CT(1,1)                                             00006080
```

```
      CT(2,2)=CT(1,2)                                                   00006090
      DEN(2,1)=DEN(1,1)                                                 00006100
      DEN(2,2)=DEN(1,2)                                                 00006110
      DO 4 II=1,2                                                       00006120
      DO 4 I=1,3                                                        00006130
      IF(CT(I,II).EQ.0.) CT(I,II)=CT1(I,II)                             00006140
    4 IF(DEN(I,II).EQ.0.) DEN(I,II)=DEN1(I,II)                          00006150
      WRITE(6,1206)                                                     00006160
 1206 FORMAT(/T43,'MATERIAL DATA',/T39,21('-'),/T40,'DENSITY',          00006170
     *      T54,'COST',/T39,21('-'),T52,8('-'))                        00006180
      DO 30 I=1,3                                                       00006190
   30 WRITE(6,1207) (OP(I+15,II),II=1,5),DEN(I,1),CT(I,1)               00006200
      DO 31 I=1,3                                                       00006210
   31 WRITE(6,1207) (OP(I+18,II),II=1,5),DEN(I,2),CT(I,2)               00006220
 1207 FORMAT(T6,5A4,T39,F8.6,T52,F8.2)                                  00006230
    5 WRITE(6,1210)                                                     00006240
 1210 FORMAT(/T5,'PLY DESCRIPTION',/T39,47('-'),/T23,'BEND DATA',T53,   00006250
     *'RECT',T67,'NON-RECT',T80,'MATL',/T18,19('-'),T48,14('-'),T64,     00006260
     *14('-'),T79,7('-'),/,                                             00006270
     *T2,'LD #P LH DT TB  LENGTH   CR     FW   CK1  CT  LENGTH   WIDTH  00006280
     * AREA    DIST  F T WD',/T2,5('-- '),' ------  -----  ----  --  --00006290
     *',4('  ------'),' - - ---')                                        00006300
C                                                                       00006310
   10 READ(5,1300)(IBK(I),I=1,4),IBD,(BD(I),I=1,3),IPY(1),              00006320
     *IPY(2),(PY(I),I=3,6),IMT(1),IMT(2),PY(7)                          00006330
      IF(IBK(1).EQ.9) GO TO 900                                         00006340
 1300 FORMAT(T1,I1,I2,3I1,T11,F7.2,T21,F7.2,T31,F7.2,/T1,I3,T11,I3,T21, 00006350
     *F7.2,T31,F7.2,T41,F7.2,T51,F7.2,T61,I1,I1,T71,F3.0)               00006360
      WRITE(8,1400)(IBK(I),I=1,4),IBD,(BD(I),I=1,3),IPY(1),             00006370
     *IPY(2),(PY(I),I=3,6),IMT(1),IMT(2),PY(7)                          00006380
 1400 FORMAT(T3,5(I1,2X),T18,F6.2,T26,F5.2,T33,F4.2,T39,I3,             00006390
     *T44,I2,T46,4(F6.2,2X),T79,2(I1,1X),T83,F3.0)                      00006400
C                                                                       00006410
      IPY(1)=IABS(IPY(1))                                               00006420
      PY(1)=FLOAT(IPY(1))                                               00006430
      PY(2)=FLOAT(IPY(2))                                               00006440
  100 IF(IBK(1).EQ.0) GO TO 300                                         00006450
      IF(IBK(1).EQ.1.OR.IBK(1).EQ.2) GO TO 110                          00006460
      WRITE(6,5000)                                                     00006470
 9000 FORMAT(T2,'*** ERROR ** -- INCORRECT LAYUP DESCRIPTION CODE USED. 00006480
     *PROGRAM ENDED')                                                   00006490
```

```
      GO TO 999                                                          C0006500
  110 IF(IBK(3).GE.1.AND.IBK(3).LE.5) GO TO 120                          C0006510
      IBK(3)=1                                                           C0006520
      WRITE(6,9100)                                                      C0006530
 9100 FORMAT(T2,'** ERROR ** -- INCORRECT LAYUP HANDLING CODE, SET TO MA C0006540
     *NUAL')                                                             C0006550
  120 IF(IBK(4).EQ.1.OR.IBK(4).EQ.2) GO TO 130                           C0006560
      IBK(4)=1                                                           C0006570
      WRITE(6,9110)                                                      C0006580
 9110 FORMAT(T2,'** ERROR ** -- INCORRECT DEPOSITION TECHNIQUE CODE, SET C0006590
     * TO PLY-ON-PLY')                                                  C0006600
  130 IF(IBK(2).EQ.0) IBK(2)=1                                           C0006610
C                                                                        C0006620
C COMPUTE BEND FACTOR FOR BOOK                                           C0006630
C                                                                        C0006640
      NNN=IBKO(2)                                                        C0006650
      IF(IEKO(1).EQ.2) NNN=IBKO(2)*IPY1                                  C0006660
      BEND2(IBKO(1))=BEND2(IBKO(1))+BEND1(IBKO(1))*FLOAT(NNN)            C0006670
      BEND1(IBKO(1))=0.                                                  C0006680
      IPY1=0.                                                            C0006690
C                                                                        C0006700
C BOOK FORMATION CALCULATION                                             C0006710
C                                                                        C0006720
      IF(IEKO(1).NE.1) GO TO 150                                         C0006730
C                                                                        C0006740
C 'POSITION MYLAR' FOR  PLY-ON-PLY                                       C0006750
      IF(IEKO(4).NE.1) GO TO 140                                         C0006760
      Y3=AA(3,1)*BAREA**AA(3,2)                                          C0006770
      R3=R3+(Y3*FLOAT(IBKO(2)))                                          C0006780
C                                                                        C0006790
C 'TRANSFER PLY' FOR BOOK                                                C0006800
  140 Y6=AA(6,1)*BAREA**AA(6,2)                                          C0006810
      R6=R6+(Y6*FLOAT(IBKO(2)))                                          C0006820
  150 DO 151 I=1,4                                                       C0006830
  151 IBKO(I)=IBK(I)                                                     C0006840
      IF(BAREA.GT.PAREA) PAREA=BAREA                                     C0006850
C                                                                        C0006860
C BEND FACTORS                                                           C0006870
C                                                                        C0006880
  300 IF(IBD.EQ.0) GO TO 900                                             C0006890
      IF(IBD.LE.7) GO TO 305                                             C0006900
```

```
      IBD=0                                                                  00006910
      WRITE(6,9120)                                                          00006920
 9120 FORMAT(T2,'*** ERROR ** -- INCORRECT BEND CODE USED, BEND FACTOR NOCCCC6930
     *T COMPUTED FOR THIS LINE')                                             00006940
      GO TO 500                                                              00006950
  505 IF(IBD.EQ.3.AND.BD(2).LE.2.) IBD=1                                     00006960
      IF(IBD.EQ.4.AND.BD(2).LE.2.) IBD=2                                     00006970
      GO TO (310,310,330,330,350,350,370),IBD                                00006980
  310 BEND=AB(IBD,1)*BD(1)                                                   00006990
      GO TO 400                                                              00007000
  330 BEND=AB(IBD,1)*BD(2)**AB(IBD,2)*BD(1)                                  00007010
      GO TO 400                                                              00007020
  350 BEND=AB(IBD,1)*BD(2)**AB(IBD,2)*BD(3)**AB(IBD,3)*BD(1)                 00007030
      GO TO 400                                                              00007040
  370 BEND=(AB(IBD,1)*BD(2)**AB(IBD,2)+AB(IBD,3))*BD(1)                      00007050
  400 BEND1(IBKD(1)    =END1(IBKD(1))+BEND                                   00007060
C                                                                            00007070
C PLY FACTORS                                                                00007080
C                                                                            00007090
  500 IF(PY(2).EQ.0) GO TO 10                                                00007100
      IF(PY(5).EQ.0.) PY(5)=PY(2)*PY(4)                                      00007110
      RDN=ATAN(1.0)/45.                                                      00007120
      PY(1)=PY(1)*RDN                                                        00007130
      IF(PY(6).EQ.0.) PY(6)=(PY(3)*SIN(PY(1)))+(PY(4)*COS(PY(1)))            00007140
      PY(1)=PY(1)/RDN                                                        00007150
      IF(PY(6).NE.0..AND.PY(7).NE.0..AND.PY(5).NE.0.) GO TO 505              00007160
      WRITE(6,9150)                                                          00007170
 9150 FORMAT(T2,'*** ERROR ** --MISSING PLY DESCRIPTION DATA, PROGRAM ENDCCCC7180
     *ED')                                                                   00007190
      GO TO 999                                                              00007200
  505 TSN=(PY(6)+2.*TA)/PY(7)                                                00007210
      ITSN=TSN                                                               00007220
      IF(TSN.GT.(FLOAT(ITSN))) TSN=FLOAT(ITSN)+1.                            00007230
      TSL=PY(5)/PY(6)+(2.*TA)                                                00007240
      AREA=TSN*TSL*PY(7)                                                     00007250
      NPB=IBKD(2)*IPY(2)                                                     00007260
      SCP=AREA-PY(5)                                                         00007270
C                                                                            00007280
C RUN TIME FOR PLY DEPOSITION                                                00007290
      IF(IMT(1).NE.2) GO TO 510                                              00007300
C BROADGOODS                                                                 00007310
```

```
      Y4=A(3,2)*AREA**B(3,2)                                                    00007320
      S4=C(3,2)*S4                                                              00007330
      C(3,2)=0.                                                                 00007340
      TMT1(3,IMT(2))=TMT1(3,IMT(2))+(AREA*FLOAT(NPE))                           00007350
      TMT2(3,IMT(2))=TMT2(3,IMT(2))+(SCP*FLOAT(NPB))                            00007360
      GO TO 540                                                                 00007370
C TAPES                                                                         00007380
  510 IF(IMT(1).EQ.1) GO TO 520                                                 00007390
      IMT(1)=1                                                                  00007400
      WRITE(6,9151)                                                             00007410
 9151 FORMAT(T2,'*** ERROR ** --INCORRECT MATERIAL FORM CODE USED, SET TO      00007420
     * TAPE')                                                                   00007430
  520 IF(IBKD(3).LE.2.OR.PY(7).GE.3.) GO TO 521                                 00007440
      PY(7)=3.                                                                  00007450
      WRITE(6,9152)                                                             00007460
  521 J=-1                                                                      00007470
      IF(PY(7).EQ.3.) J=1                                                       00007480
      IF(PY(7).EQ.12.) J=2                                                      00007490
      IF(J)525,525,530                                                          00007500
  525 PY(7)=3.                                                                  00007510
      J=1                                                                       00007520
      WRITE(6,9152)                                                             00007530
 9152 FORMAT(T2,'*** ERROR ** --INCORRECT INPUT FOR TAPE'S MATERIAL WILL       00007540
     *M, SET TO 3')                                                           00007550
  530 K=IBKD(3)                                                                 00007560
      IF(J.EQ.1.AND.IBKD(3).EQ.3.AND.TSL.GE.25.) K=6                            00007570
      Y4=A(K,J)*TSL**B(K,J)*TSN                                                 00007580
      S4=S4+C(IBKD(3),J)                                                        00007590
      C(IBKD(3),J)=0.                                                           00007600
      TMT1(J,IMT(2))=TMT1(J,IMT(2))+(AREA*FLOAT(NPP))                           00007610
      TMT2(J,IMT(2))=TMT2(J,IMT(2))+(SCP*FLOAT(NPB))                            00007620
C                                                                               00007630
  540 Y4=Y4*FLOAT(NPB)                                                          00007640
      R4=R4+Y4                                                                  00007650
      IPY1=IPY1+IPY(2)                                                          00007660
      IF(AREA.GT.BAREA) BAREA=AREA                                              00007670
C                                                                               00007680
C *POSITION MYLAR* FOR PLY-ON-MYLAR                                             00007690
  600 IF(IBKD(4).NE.2) GO TO 610                                                00007700
      Y3=AA(3,1)*AREA**AA(3,2)*FLOAT(NPB)                                       00007710
      R3=R3+Y3                                                                  00007720
```

```
      C                                                                 00007730
      C *STACK PLIES* FOR BOOK*S PLY-ON-MYLAR                           00007740
  610   IF(IBKD(1).NE.1.OR.IBKU(4).NE.2) GO TO 620                      00007750
            Y5=AA(5,1)*AREA**AA(5,2)*FLOAT(NPB)                         00007760
            R5=R5+Y5                                                    00007770
      C                                                                 00007780
      C *TRANSFER PLY* FOR PLY*S PLY-ON-MYLAR                           00007790
  620   IF(IBKD(1).NE.2.OR.IBKU(4).NE.2) GO TO 630                      00007800
            Y6=AA(6,1)*AREA**AA(6,2)*FLOAT(NPB)                         00007810
            R6=R6+Y6                                                    00007820
      C                                                                 00007830
  630   GO TO 10                                                        00007840
      C                                                                 00007850
      C END OF ALL INPUT                                                00007860
      C                                                                 00007870
  900   NNN=IBKD(2)                                                     00007880
            IF(IBKD(1).EQ.2) NNN=IBKD(2)*IPY1                           00007890
            BEND2(IBKD(1))=BEND2(IBKD(1))+BEND1(IBKD(1))*FLOAT(NNN)     00007900
            IF(IBKD(1).NE.1) GO TO 920                                  00007910
            IF(IBKD(4).NE.1) GO TO 910                                  00007920
            Y3=AA(3,1)*BAREA**AA(3,2)                                   00007930
            R3=R3+(Y3*FLOAT(IBKD(2)))                                   00007940
  910       Y6=AA(6,1)*BAREA**AA(6,2)                                   00007950
            R6=R6+(Y6*FLOAT(IBKD(2)))                                   00007960
  920       IF(BAREA.GT.PAREA) PAREA=BAREA                              00007970
            TBEND=(BEND2(1)+BEND2(2))*FLOAT(IQT)                        00007980
      C                                                                 00007990
      C COMPUTE FINAL SET-UP AND RUN TIME                               00008000
      C                                                                 00008010
            R(1)=AA(1,1)*PAREA                                          00008020
            IF(ITL.EQ.1) R(2)=AA(2,1)*PAREA                             00008030
            R(3)=R3                                                     00008040
            R(4)=R4+BEND2(2)                                            00008050
            R(5)=R5                                                     00008060
            R(6)=R6+BEND2(1)                                            00008070
            IF(ITL.EQ.1) GO TO 950                                      00008080
            DO 930 I=7,9                                                00008090
  930       R(I)=AA(I,1)*PAREA**AA(I,2)                                 00008100
  950       S(4)=S4                                                     00008110
            DO 951 I=11,13                                              00008120
  951       R(I)=(AA(I,1)+AA(I,2)*SAW(I-10,1))*SAW(I-10,2)              00008130
```

```
      IF(R(11).EQ.0..AND.R(12).EQ.0..AND.R(13).EQ.0.) GO TO 957
      R(10)=AA(10,1)*SAR**AA(10,2)
      S(10)=.10
  957 IF(NDB.EQ.1) R(14)=AA(14,1)*PAREA**AA(14,2)*FLOAT(NDR)
      IF(NDB.EQ.1) S(14)=.02
      IF(NDB.EQ.2) R(15)=AA(15,1)*PAREA**AA(15,2)*FLOAT(NDR)
      IF(NDB.EQ.2) S(15)=.02
      DO 940 I=1,15
  940 R(I)=R(I)*FLOAT(IGT)
      DO 941 I=1,3
      DO 941 II=1,2
      TMT1(I,II)=TMT1(I,II)*FLOAT(IGT)
  941 TMT2(I,II)=TMT2(I,II)*FLOAT(IGT)
      DO 952 I=1,9
      SUM1=SUM1+S(I)
  952 SUM2=SUM2+R(I)
      DO 953 I=1,15
      SUMT1=SUMT1+S(I)
  953 SUMT2=SUMT2+R(I)
      SUM(1,1)=SUM(1,1)+SUMT1
      SUM(1,2)=SUM(1,2)+SUMT2
      DO 955 I=1,3
      DO 955 II=1,2
      IF(TMT1(I,II).EQ.0.) GO TO 955
      TMT3(I,II)=(TMT2(I,II)/(TMT1(I,II)-TMT2(I,II)))*100.
  955 CONTINUE
C
      DO 956 I=1,3
      DO 958 II=1,2
      TMT(I,II)=TMT(I,II)+TMT1(I,II)
      TMT2T(I,II)=TMT2T(I,II)+TMT2(I,II)
  958 TMTT=TMTT+TMT1(I,II)
      TMTTT=TMTTT+TMTT
      DO 961 I=1,3
      DO 961 II=1,2
      WT(I,II)=(TMT1(I,II)-TMT2(I,II))*DEN(I,II)
      CST(I,II)=WT(I,II)*CT(I,II)
      WTT(I,II)=WTT(I,II)+WT(I,II)
  961 CSTT(I,II)=CSTT(I,II)+CST(I,II)
C
C WRITE PART NO. & AREA TO FILE
```

```
      C                                                                 C0006550
            WRITE(10,1590) (PART(2,II),II=1,5),PAREA,TMTT               C0006560
       1590 FORMAT(1X,5A4,2X,F10.2,2X,F10.2)                            00006570
      C                                                                 C0006580
      C                                                                 C0006590
      C WRITE SET-UP AND RUN TIME                                       C0006600
      C                                                                 C0006610
            WRITE(8,2000)                                               C0006620
       2000 FORMAT('1',///T38,'LAYUP',/T38,5('-'),                      C0006630
           *//T6,'FACTORY STANDARD HOURS',T40,'SET-UP',T55,'RUN',        00006640
           */T6,26('-'),T39,8('-'),T52,8('-'),/)                        00006650
      C                                                                 C0006660
            DO 970 I=1,9                                                00006670
            IF(R(I).NE.0.) WRITE(8,2100)(OP(I,II),II=1,5),S(I),R(I)     C0006680
        970 CONTINUE                                                    C0006690
       2100 FORMAT(T6,5A4,T39,F8.3,T52,F8.3)                            C0006700
            WRITE(8,2101)SUM1,SUM2                                      C0006710
       2101 FORMAT(T8,'SUBTOTAL',T39,F8.3,T52,F8.3,/)                   00006720
            DO 972 I=10,15                                              00006730
            IF(R(I).NE.0.) WRITE(8,2003) (OP(I,II),II=1,5),S(I),R(I)    00006740
        972 CONTINUE                                                    00006750
       2003 FORMAT(T6,5A4,T39,F8.3,T52,F8.3)                            00006760
            WRITE(8,2005) SUMT1,SUMT2                                   C0006770
       2005 FORMAT(/T6,'TOTAL LAYUP', T39,F8.3,T52,F8.3,                00006780
           *       /T39,8('*'),T52,8('*'))                              00006790
      C                                                                 00006800
      C WRITE MATERIAL USAGE                                            C0006810
      C                                                                 C0006820
            WRITE(8,2300) TBEND                                         C0006830
       2300 FORMAT(//T6,'BENCH FACTOR HOURS',T52,F8.3)                  00006840
            WRITE(8,2400)                                               00006850
       2400 FORMAT(/T41,'USAGE',T54,'SCRAP',T66,'PERCENT',              C0006860
           */T6,'MATERIAL',T39,'(SQ.IN.)',T52,'(SQ.IN.)',T67,'SCRAP',   00006870
           */T6,8('-'),T39,8('-'),T52,8('-'),T65,8('-'),/)              00006880
            DO 980 I=1,3                                                00006890
            IF(TMT1(I,1).NE.0.) WRITE(8,2401) (OP(I+15,II),II=1,5),     00006900
           *                    TMT1(I,1),TMT2(I,1),TMT3(I,1)           00006910
        980 CONTINUE                                                    00006920
            DO 981 I=1,3                                                00006930
            IF(TMT1(I,2).NE.0.) WRITE(8,2401) (OP(I+18,II),II=1,5),     00006940
           *                    TMT1(I,2),TMT2(I,2),TMT3(I,2)           00006950
```

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C99     911 CONTINUE                                                          C0008960
900    2401 FORMAT(T6,5A4,T39,F8.2,T52,F8.2,T65,F8.2)                         C0008970
901  C                                                                        C0008980
902        WRITE(8,2410)                                                      C0008990
903    2410 FORMAT(//T40,'WEIGHT',T54,'COST',/T39,8('-'),T52,8('-'),/)        C0009000
904        DO 985 I=1,3                                                       C0009010
905        IF(WT(I,1).NE.0.) WRITE(8,2401) (OP(I+15,II),II=1,5),              C0009020
906       *                  WT(I,1),CST(I,1)                                C0009030
907     985 CONTINUE                                                         C0009040
908        DO 986 I=1,3                                                       C0009050
909        IF(WT(I,2).NE.0.) WRITE(8,2401) (OP(I+18,II),II=1,5),              C0009060
910       *                  WT(I,2),CST(I,2)                                C0009070
911     986 CONTINUE                                                         C0009080
912   19000 CONTINUE                                                         C0009090
913  C                                                                        C0009100
914        DO 988 I=1,3                                                       C0009110
915        DO 988 II=1,2                                                      C0009120
916         CSTSCP=CSTSCP+(TMT2T(I,II)*DEN(I,II)*CT(I,II))                   C0009130
917         WGT1=WGT1+WTT(I,II)                                              C0009140
918     988 COST1=COST1+CSTT(I,II)                                           C0009150
919  C                                                                        C0009160
920        RETURN                                                             C0009170
921     999 STOP                                                             C0009180
922        END                                                                C0009190
923  C                                                                        C0009200
924  C                                                                        C0009210
925  C                                                                        C0009220
926  C                                                                        C0009230
927        SUBROUTINE CORE(IN2)                                               C0009240
928        DIMENSION OP(60,5),PART(2,5),A(60,3),R(60),S(60),SUM(5,2),         C0009250
929       *          COR(4),COR1(14),COR2(4)                                 C0009260
930        COMMON /X/OP,SUM,R,S,PART                                          C0009270
931       *       /XX/A                                                      C0009280
932       *       /XZ/COST2,WGT2                                             C0009290
933  C                                                                        C0009300
934        WGT2=0.                                                            C0009310
935  C                                                                        C0009320
936  C READ COEFFICIENTS                                                     C0009330
937        DO 21 I=1,24                                                       C0009340
938     21 READ(2,21000)(OP(I,J),J=1,5),(A(I,J),J=1,3)                       C0009350
939  21000 FORMAT(T1,5A4,T31,F8.6,T41,F8.6,T51,F8.6)                         C0009360
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C                                                                       00009370
      DO 2900 L=1,IN2                                                   00009380
      DO 210 I=1,24                                                     00009390
      R(I)=0.                                                           00009400
  210 S(I)=0.                                                           00009410
C READ INPUT FOR EACH PART                                              00009420
      READ(5,2111C)((PART(I,J),J=1,5),I=1,2),IGTY2,(COR(I),I=1,4),CT,   00009430
     *          COR1(1)                                                00009440
      READ(5,21110) ((COR1(I),COR2(I-1)),I=2,5),(COR1(I),I=6,14)        00009450
21100 FORMAT(T1,5A4,5A4,I3,/T1,F7.5,T11,F7.2,T21,F7.2,T31,F7.2,         00009460
     *T41,F7.2,T51,F7.2)                                                00009470
21110 FORMAT(T1,8(F7.2,3X),/T1,F7.2,T11,F4.0,T21,F2.0,T31,F7.2,         00009480
     *       T41,F2.0,T43,F3.0,T46,F3.0,T51,F7.2,T61,F7.2)              00009490
C                                                                       00009500
C CALCULATE SET-UP AND RUN TIME                                         00009510
C                                                                       00009520
      R(1)=A(1,1)*COR(3)**A(1,2)*COR1(1)                                00009530
      IF(R(1).EQ.0.) GO TO 2100                                         00009540
      R(2)=A(2,1)*COR(4)**A(2,2)                                        00009550
      S(1)=A(1,3)                                                       00009560
 2100 R(4)=A(4,1)*COR1(2)*COR2(1)+(A(4,2)*COR2(1))                      00009570
      R(6)=A(6,1)*COR1(3)*COR2(2)+(A(6,2)*COR2(2))                      00009580
      R(8)=A(8,1)*COR1(4)*COR2(3)                                       00009590
      R(10)=A(10,1)*COR1(5)*COR2(4)                                     00009600
      R(12)=A(12,1)*COR1(6)                                             00009610
      R(14)=A(14,1)*COR1(7)                                             00009620
      IIT=0                                                             00009630
      DO 21    I=5,15,2                                                 00009640
      IF(R(    ).EQ.0.) GO TO 2110                                      00009650
      R(I)=A(I,1)*COR(4)**A(I,2)                                        00009660
      S(I-1)=A(I-1,3)                                                   00009670
      IIT=IIT+1                                                         00009680
  2110 CONTINUE                                                         00009690
      IF(IIT.EQ.0) GO TO 2130                                           00009700
      R(3)=A(3,1)*COR(4)**A(3,2)                                        00009710
      S(3)=A(3,3)                                                       00009720
  2120 IF(COR1(8).NE.0.)  R(16)=A(16,1)*COR(4)**A(16,2)                 00009730
      IF(S(16).NE.0.) S(16)=A(16,3)                                     00009740
      IF(COR1(9).EQ.0.) GO TO 2160                                      00009750
      IF(COR(1).GT..1250) GO TO 2140                                    00009760
      I=17                                                              00009770
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      GO TO 2150                                                        00009780
2140  IF(COR(1).GT..1875) GO TO 2142                                    00009790
      I=18                                                              00009800
      GO TO 2150                                                        00009810
2142  IF(COR(1).GT..2500) GO TO 2144                                    00009820
      I=19                                                              00009830
      GO TO 2150                                                        00009840
2144  I=20                                                              00009850
2150  R(1)=A(I,1)*COR(9)                                                00009860
      S(1)=A((16+IFIX(COR1(10))),3)+(COR1(11)*A(19,3))+(COR1(12)*A(20,3))00009870
     *)                                                                 00009880
      R(21)=A(21,1)*COR(4)**A(21,2)                                     00009890
2160  R(22)=A(22,1)*COR1(13)                                            00009900
      IF(R(22).NE.0.) S(22)=A(22,3)                                     00009910
      R(23)=A(23,1)*COR1(14)                                            00009920
      IF(R(23).NE.0.) S(23)=A(23,3)                                     00009930
      R(24)=A(24,1)*(COR(3)*COR(4))**A(24,2)                            00009940
      S(24)=A(24,3)                                                     00009950
      DO 2161 I=1,24                                                    00009960
2161  R(I)=R(I)*FLOAT(IQTY2)                                            00009970
      WEIGHT=COR(2)*COR(3)*COR(4)                                       00009980
      WEIGH1=WEIGH1/1728.                                               00009990
      WEIGHT=WEIGHT*FLOAT(IQTY2)                                        00010000
      CTT=CT*(COR(4)/144.)*FLOAT(IQTY2)                                 00010010
      COST2=COST2+CTT                                                   00010020
      WGT2=WGT2+WEIGHT                                                  00010030
C                                                                       00010040
      SUMT1=0.                                                          00010050
      SUMT2=0.                                                          00010060
      DO 2200 I=1,24                                                    00010070
      SUMT1=SUMT1+S(I)                                                  00010080
2200  SUMT2=SUMT2+R(I)                                                  00010090
      SUM(2,1)=SUM(2,1)+SUMT1                                           00010100
      SUM(2,2)=SUM(2,2)+SUMT2                                           00010110
      WRITE(10,22222) (PART(2,J),J=1,5),COR(4)                          00010120
22222 FORMAT(1X,5A4,2X,F10.2)                                           00010130
C                                                                       00010140
C OUTPUT                                                                00010150
C                                                                       00010160
      WRITE(8,22000)(PART(1,J),J=1,5),IQTY2,(PART(2,J),J=1,5),CT,       00010170
     *              (COR(I),I=1,4)                                      00010180
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1022  22000 FORMAT('1',//T23,'ALUMINUM HONEYCOMB CORE PREPARATION',/T23,35('-'00010190
1023     1),//T6,'PART NAME:  ',5A4,T50,'QTY:  ',I3,/T6,'PART NUMBER:  ',5A400010200
1024     2,T50,'COST/SQ.FT.:  ',F7.2,                                       00010210
1025     3//T6,'CORE CELL SIZE:  ',F7.5,T50,'CORE DENSITY:  ',F7.2,          00010220
1026     4/T6,'CORE DEPTH:  ',F7.2,T50,'CORE AREA:  ',F7.2,/)               00010230
1027      IF(COR1(1).NE.0.) WRITE(8,22010) COR1(1)                          00010240
1028      IF(COR1(2).NE.0.) WRITE(8,22020) COR1(2),COR2(1)                  00010250
1029      IF(COR1(3).NE.0.) WRITE(8,22030) COR1(3),COR2(2)                  00010260
1030      IF(COR1(4).NE.0.) WRITE(8,22040) COR1(4),COR2(3)                  00010270
1031      IF(COR1(5).NE.0.) WRITE(8,22050) COR1(5),COR2(4)                  00010280
1032      IF(COR1(6).NE.0.) WRITE(8,22060) COR1(6)                          00010290
1033      IF(COR1(7).NE.0.) WRITE(8,22070) COR1(7)                          00010300
1034      IF(COR1(8).NE.0.) WRITE(8,22080)                                  00010310
1035      IF(COR1(9).NE.0..AND.COR1(10).EQ.1.) WRITE(8,22090) COR1(9),      00010320
1036     *COR1(11),COR1(12)                                                 00010330
1037      IF(COR1(9).NE.0..AND.COR1(10).EQ.2.) WRITE(8,22091) COR1(9),      00010340
1038     *COR1(11),COR1(12)                                                 00010350
1039      IF(COR1(13).NE.0.) WRITE(8,22100) COR1(13)                        00010360
1040      IF(COR1(14).NE.0.) WRITE(8,22110) COR1(14)                        00010370
1041  22010 FORMAT(T6,'SAWING--LENGTH OF CUT(IN.):  ',F7.2)                 00010380
1042  22020 FORMAT(T6,'FLAT MACHINING--LENGTH(IN.):  ',F7.2,                00010390
1043     *      T50,'WIDTH(IN.):  ',F7.2)                                  00010400
1044  22030 FORMAT(T6,'CONTOUR MACHINING--LENGTH(IN.):  ',F7.2,             00010410
1045     *      T50,'WIDTH(IN.):  ',F7.2)                                  00010420
1046  22040 FORMAT(T6,'STEP CUT MACHINING--LENGTH(IN.):  ',F7.2,            00010430
1047     *      T50,'WIDTH(IN.):  ',F7.2)                                  00010440
1048  22050 FORMAT(T6,'SCARF MACHINING--LENGTH(IN.):  ',F7.2,               00010450
1049     *      T50,'WIDTH(IN.):  ',F7.2)                                  00010460
1050  22060 FORMAT(T6,'END MILL MACHINING--LENGTH(IN.):  ',F7.2)            00010470
1051  22070 FORMAT(T6,'CORE CUTOUT--QTY:  ',F3.0)                          00010480
1052  22080 FORMAT(T6,'HAND FORMING')                                      00010490
1053  22090 FORMAT(T6,'BRAKE FORMING--RADIUS OF CURV(IN.):  ',F7.2,        00010500
1054     *      T50,'DIE SIZE  6"',/T21,'NO. OF DIE CHANGE:  ',F3.0,       00010510
1055     *      T50,'NO. OF DIE REPOSITION:  ',F3.0)                       00010520
1056  22091 FORMAT(T6,'BRAKE FORMING--RADIUS OF CURV(IN.):  ',F7.2,        00010530
1057     *      T50,'DIE SIZE  6"',/T21,'NO. OF DIE CHANGE:  ',F3.0,       00010540
1058     *      T50,'NO. OF DIE REPOSITION:  ',F3.0)                       00010550
1059  22100 FORMAT(T6,'LIQUID POTTING--VOLUME(CU.IN.):  ',F7.2)             00010560
1060  22110 FORMAT(T6,'TAPE FOAMING--VOLUME(CU.IN.):  ',F7.2)              00010570
1061        WRITE(8,23000)                                                 00010580
1062  23000 FORMAT(//T6,'FACTORY STANDARD HOURS',T40,'SET-UP',T55,'RUN',   00010590
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      *       /T6,28('-'),T39,8('-'),T52,8('-'),/)                                00010600
      DO 2300 I=1,24                                                            00010610
      IF(R(I).NE.0.)WRITE(8,24000) (OP(I,J),J=1,5),S(I),R(I)                    00010620
 2300 CONTINUE                                                                  00010630
24000 FORMAT(T6,5A4,T39,F8.3,T52,F8.3)                                          00010640
      WRITE(8,24100) SUMT1,SUMT2                                                00010650
24100 FORMAT(/T6,'TOTAL HOURS',T39,F8.3,T52,F8.3,/T39,8('*'),T52,8('*'))        00010660
C                                                                               00010670
      WRITE(6,24200)                                                            00010680
24200 FORMAT(//T40,'WEIGHT',T54,'COST',/T39,8('-'),T52,8('-'))                  00010690
      WRITE(8,24201) WEIGHT,CTT                                                 00010700
24201 FORMAT(/T6,'HONEYCOMB COKE',T39,F8.2,T52,F8.2)                            00010710
C                                                                               00010720
 2900 CONTINUE                                                                  00010730
C                                                                               00010740
      RETURN                                                                    00010750
 9999 STOP                                                                      00010760
      END                                                                       00010770
C                                                                               00010780
C                                                                               00010790
C                                                                               00010800
C                                                                               00010810
      SUBROUTINE CONSL(IN3)                                                     00010820
      INTEGER*4 IOP(60,2),IECO(60),IN(5)                                        00010830
      DIMENSION OP(60,5),PART(2,5),A(60,3),R(60),S(60),SUM(5,2),                00010840
     *          PNM(10,5),PNO(10,5),PNUM(5),                                    00010850
     *          BDIM(3),AP(2),APAR1(10),APAR2(10),IQTY(10)                      00010860
      COMMON /X/OP,SUM,R,S,PART                                                 00010870
     *       /XX/A                                                            00010880
     *       /X3/APAR1,APAR2,IQTY,NOP                                         00010890
     *       /X31/IN                                                          00010900
     *       /X34/PNUM                                                        00010910
C                                                                               00010920
C                                                                               00010930
23000 FORMAT(//T6,'FACTORY STANDARD HOURS',T40,'SET-UP',T55,'RUN',              00010940
     *       /T6,26('-'),T39,8('-'),T52,8('-'),/)                             00010950
24000 FORMAT(T6,5A4,T39,F8.3,T52,F8.3)                                          00010960
24100 FORMAT(/T6,'TOTAL HOURS',T39,F8.3,T52,F8.3,/T39,8('*'),T52,8('*'))        00010970
C                                                                               00010980
30000 FORMAT(5A4,5A4,T41,I3,T51,I2)                                             00010990
30020 FORMAT(I1,I1,T2,F7.2,T11,3(I1),F7.2,T21,F7.2,T31,F7.2,T41,F7.2,           00011000
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1104          *        T51,F7.2,T61,F7.2,T71,F7.1)
1105    30100 FORMAT(1X,5A4,2X,F10.2,2X,F7.2,2X,F7.1)                          00011010
1106          C                                                                00011020
1107          C READ OPERATIONS AND COEFFICIENTS                               00011030
1108          C                                                                00011040
1109                DO 310 I=1,60                                              00011050
1110            310 READ(3,30001) (OP(I,J),J=1,5),(A(I,J),J=1,3),(IOP(I,J),J=1,2)  00011060
1111    30001 FORMAT(T1,5A4,T31,F8.0,T41,F8.0,T51,F8.0,T61,I1,T63,I1)          00011070
1112                DO 3900 L=1,IN3                                            00011080
1113          C                                                                00011090
1114          C READ IN DATA                                                   00011100
1115                READ(5,30000)((PART(I,J),J=1,5),I=1,2),IQTY3,NOP           00011110
1116                DO 320 I=1,NOP                                             00011120
1117            320 READ(5,30010) (PNM(I,J),J=1,5),(PNO(I,J),J=1,5),IQTY(I)    00011130
1118    30010 FORMAT(5A4,5A4,I3)                                               00011140
1119                READ(5,30020) IADH,AADH,IADH1,IBAG1,IBAG2,BR,ABAG,APER,    00011150
1120               *(BOIM(I),I=1,3),ICUR                                       00011160
1121          C                                                                00011170
1122          C FIND ALL DATA OF COMPONENT PART                                00011180
1123          C                                                                00011190
1124                QTY3=FLOAT(IQTY3)                                          00011200
1125                DO 325 I=1,NOP                                             00011210
1126                APAR1(I)=0.                                                00011220
1127            325 APAR2(I)=0.                                                00011230
1128                ITEST=0                                                    00011240
1129                REWIND 10                                                  00011250
1130            330 READ(10,30100,END=399)  (PNUM(J),J=1,5),AP(1),AP(2)        00011260
1131            332 DO 335 I=1,NOP                                             00011270
1132                DO 333 J=1,5                                               00011280
1133                IF(PNO(I,J).NE.PNUM(J))GO TO 335                           00011290
1134            333 CONTINUE                                                   00011300
1135                IF(APAR1(I).NE.0.) GO TO 330                               00011310
1136                APAR1(I)=AP(1)                                             00011320
1137                APAR2(I)=AP(2)                                             00011330
1138                ITEST=ITEST+1                                              00011340
1139                IF(ITEST.EQ.NOP) GO TO 340                                 00011350
1140                GO TO 330                                                  00011360
1141            335 CONTINUE                                                   00011370
1142          C                                                                00011380
1143                GO TO 330                                                  00011390
1144            399 WRITE(6,30100)                                             00011400
                                                                               00011410
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 5010 FORMAT(12,'ERROR — DATA ON A PART USED IN PART CONSOLIDATION WAS
     *NOT FOUND, PLEASE CHECK PART NO.  PROGRAM TERMINATED')
      GO TO 9999
  340 IF(IBAG1.EQ.0.OR.ABAG.EQ.0..OR.APER.EQ.0.) GO TO 343
      IBAG=1
      GO TO 350
  343 IF(BDIM(1).EQ.0..OR.BDIM(2).EQ.0..OR.BDIM(3).EQ.0.) GO TO 345
      IBAG=2
      ABAG=2.*((BDIM(1)*BDIM(2))+(BDIM(2)*BDIM(3))+(BDIM(1)*BDIM(3)))
      GO TO 350
  345 IBAG=0
  350 DO 351 I=1,60
      R(I)=0.
  351 S(I)=0.
C
C COMPUTE ADHESIVE RUN TIME
C
      IF(IADH.EQ.0) GO TO 360
      IF(IBAG.EQ.1) GO TO 353
      R(1)=A(1,1)
      R(2)=A(2,1)*AADH
      R(3)=PCON(A(3,1),A(3,2))
      GO TO 3360
C
  353 R(6)=AADH*A(6,1)
  360 IF(IBAG.NE.1) GO TO 380
      IF(ICUR.NE.1.AND.ICUR.NE.2) ICUR=1
      IF(ABAG.LT.432.) BQTY=1.
      IF(ABAG.GE.432.) BQTY=2.
      IF(BK.EQ.0.) BK=3.
      R(4)=A(4,ICUR)
      IF(NOP.GT.1) R(5)=PCON(A(5,1),A(5,2))
      IF(NOP.GT.1) R(7)=PCON(A(7,1),A(7,2))
C
      IF(IBAG2.EQ.0) GO TO 365
      R(8)=A(8,1)*ABAG
      SPART=0.
      DO 362 I=1,NOP
  362 SPART=SPART+APAR2(I)
      R(9)=A(9,1)*(SPART/HR)
C
```

```
      365 DO 370 I=10,22                                                00011830
      370 IBCD(I)=IBAG1                                                 00011840
          DO 371 I=23,38                                                00011850
      371 IBCD(I)=ICUR                                                  00011860
          DO 372 I=39,46                                                00011870
      372 IBCD(I)=IBAG1                                                 00011880
          ISTART=10                                                     00011890
          ISTOP=46                                                      00011900
          GO TO 3000                                                    00011910
C                                                                       00011920
      380 IF(IBAG.NE.2) GO TO 3300                                      00011930
          IF(ICUR.NE.2.AND.ICUR.NE.3) ICUR=2                            00011940
          ICUR1=ICUR                                                    00011950
          IF(ICUR.EQ.3) ICUR1=1                                         00011960
          DO 382 I=47,60                                                00011970
      382 IBCD(I)=ICUR1                                                 00011980
          ISTART=47                                                     00011990
          ISTOP=60                                                      00012000
C                                                                       00012010
C COMPUTE RUN TIME                                                      00012020
C                                                                       00012030
 3000 DO 3100 I=ISTART,ISTOP                                            00012040
          ICP1=ICP(I,IBCD(I))+1                                         00012050
          GO TO (3100,3010,3020,3030,3040,3050),ICP1                    00012060
C                                                                       00012070
 3010 R(I)=A(I,IBCD(I))                                                 00012080
          GO TO 3100                                                    00012090
 3020 R(I)=A(I,1)*DUTY                                                  00012100
          GO TO 3100                                                    00012110
 3030 R(I)=A(I,1)*APER                                                  00012120
          GO TO 3100                                                    00012130
 3040 R(I)=A(I,1)*ABAG**A(I,2)                                          00012140
          GO TO 3100                                                    00012150
 3050 R(I)=PCON(A(I,1),A(I,2))                                          00012160
 3100 CONTINUE                                                          00012170
          IF(IBAG.NE.1) GO TO 3200                                      00012180
          IF (R(25).NE.0) R(25)=R(25)+A(25,3)                           00012190
          R(28)=(A(28,1)*ABAG)+(A(28,2)*APER)+(A(28,3)*DUTY)            00012200
          IF (R(38).NE.0) R(38)=R(38)+A(38,3)                           00012210
          IF(IBAG2.NE.0) R(44)=R(44)+A(44,3)*ABAG                       00012220
 3200 IF(IBAG.NE.2) GO TO 3201                                          00012230
```

```
      R(46)=R(48)+A(46,3)                                              00012240
      R(59)=R(59)+A(59,3)                                              00012250
 3201 AP1=0.                                                           00012260
      AP2=0.                                                           00012270
      DO 3210 I=1,NOP                                                  00012280
      AP1=AP1+APAR1(I)*QTY3                                            00012290
 3210 AP2=AP2+APAR2(I)*QTY3                                            00012300
      IF(IPAC.EQ.2) APER=2.*(BLIM(1)+BLIM(2))                          00012310
C                                                                      00012320
C SET POINTER TO END OF FILE                                           00012330
C                                                                      00012340
 3300 REWIND 10                                                        00012350
      IPOINT=IN(1)+IN(2)+L-1                                           00012360
      DO 3230 I=1,IPOINT                                               00012370
 3230 READ(10,30111)POINT                                              00012380
30111 FORMAT(1X,A4)                                                    00012390
C                                                                      00012400
      WRITE(10,30100)(PART(2,J),J=1,5),AP1,AP2                         00012410
      WRITE(11,30100)(PART(2,J),J=1,5),APER                            00012420
C                                                                      00012430
      SUMT1=0.                                                         00012440
      SUMT2=0.                                                         00012450
      DO 3309 I=2,3                                                    00012460
      R(I)=R(I)*QTY3                                                   00012470
 3309 SUMT1=SUMT1+R(I)                                                 00012480
      DO 3310 I=5,47                                                   00012490
      R(I)=R(I)*QTY3                                                   00012500
 3310 SUMT1=SUMT1+R(I)                                                 00012510
      DO 3320 I=48,60                                                  00012520
      R(I)=R(I)*QTY3                                                   00012530
 3320 SUMT1=SUMT1+R(I)                                                 00012540
      SUMT2=R(1)+R(4)+R(47)                                            00012550
      SUM(3,1)=SUMT2+SUM(3,1)                                          00012560
      SUM(3,2)=SUMT1+SUM(3,2)                                          00012570
C                                                                      00012580
C OUTPUT                                                               00012590
C                                                                      00012600
      WRITE(6,31000) L,((PART(I,J),J=1,5),I=1,2),ICTY3                 00012610
31000 FORMAT('1',//T25,'PART CONSOLIDATION',/T25,18('-'),              00012620
     */T6,'CYCLE NO.:  ',I3,                                           00012630
     */T6,'PART NAME:  ',5A4,/T6,'PART NUMBER:  ',5A4,                 00012640
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      *T50,'QTY:  ',I3)                                                  00012650
       WRITE(6,31100)                                                    00012660
31100 FORMAT(//T20,'COMPONENT DETAIL PARTS',/T6,51('-'),                 00012670
      */T11,'PART NAME',T36,'PART NO.',T54,'QTY',                        00012680
      */T6,20('-'),T30,20('-'),T54,3('-')/)                              00012690
       DO 3400 I=1,NDP                                                   00012700
 3400 WRITE(6,31200) (PNM(I,J),J=1,5),(PNO(I,J),J=1,5),ICTY(I)           00012710
31200 FORMAT(T6,5A4,T30,5A4,T54,I3)                                      00012720
       IF(IADH.EQ.0) GO TO 3410                                          00012730
       IF(IADH1.EQ.1) WRITE(6,31310)AADH                                 00012740
       IF(IADH1.EQ.2) WRITE(6,31311)AADH                                 00012750
31310 FORMAT(//T6,'ADHESIVE:  BONDING',T50,'APPLICATION AREA:  ',F7.2)   00012760
31311 FORMAT(/T6,'ADHESIVE:  CORE SPLICING',T50,'APPLICATION AREA:  ',    00012770
      *F7.2)                                                             00012780
 3410 IF(IBAG.EQ.0) GO TO 3600                                           00012790
       IF(IBAG.EQ.2) GO TO 3500                                          00012800
       IF(IBAG1.EQ.1) WRITE(6,31500)                                     00012810
       IF(IBAG1.EQ.2) WRITE(6,31501)                                     00012820
31500 FORMAT(/T6,'VACUUM BAGGING:  DISPOSABLE')                          00012830
31501 FORMAT(/T6,'VACUUM BAGGING:  REUSABLE')                            00012840
       IF(IBAG2.EQ.1) WRITE(6,31510) BR                                  00012850
31510 FORMAT(T6,'RESIN BLEED PLIES-TO-BLEEDER RATIO:  ',F3.1)            00012860
       WRITE(6,31520)ABAG,APER                                           00012870
31520 FORMAT(T6,'BAGGING AREA:  ',F7.2,                                  00012880
      *T50,'SEALING/CLAMPING PERIMETER:  ',F7.2)                          00012890
       GO TO 3505                                                        00012900
 3500 WRITE(6,31530)(BDIM(I),I=1,3)                                      00012910
31530 FORMAT(/T6,'THERMAL EXPANSION MOLD CAGE DIMENSION:  ',             00012920
      */T6,'LENGTH:  ',F7.2,/T6,'WIDTH:  ',F7.2,/T6,'DEPTH:  ',F7.2)     00012930
 3505 GO TO (3510,3520,3530),ICUR                                        00012940
 3510 WRITE(6,31531)                                                     00012950
31531 FORMAT(/T6,'CURING TOOL:  AUTOCLAVE')                              00012960
       GO TO 3600                                                        00012970
 3520 WRITE(6,31532)                                                     00012980
31532 FORMAT(/T6,'CURING TOOL:  OVEN')                                   00012990
       GO TO 3600                                                        00013000
 3530 WRITE(6,31533)                                                     00013010
31533 FORMAT(/T6,'CURING TOOL:  HEATING ELEMENT')                        00013020
 3600 WRITE(6,34003)                                                     00013030
34003 FORMAT('1',//T25,'PART CONSOLIDATION',/T25,18('-')/)                00013040
C                                                                        00013050
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1309          WRITE(6,23000)                                                  00013060
1310          IF(R(1).NE.0.)WRITE(8,24000)(DP(1,J),J=1,5),R(1)                00013070
1311          IF(R(2).NE.0.)WRITE(8,34000)(DP(2,J),J=1,5),R(2)                00013080
1312          IF(R(3).NE.0.)WRITE(6,34000)(DP(3,J),J=1,5),R(3)                00013090
1313   34000 FORMAT(T6,5A4,T52,F8.3)                                          00013100
1314          IF(IBAG.EQ.0) GO TO 3700                                        00013110
1315          IF(IBAG.NE.1) GO TO 3620                                        00013120
1316          WRITE(8,34001)(DP(4,J),J=1,5),R(4)                              00013130
1317   34001 FORMAT(T6,5A4,T39,F8.3)                                          00013140
1318          WRITE(8,33000)                                                  00013150
1319   33000 FORMAT(/T6,'BEFORE CURE')                                        00013160
1320          DO 3611 I=5,29                                                  00013170
1321          IF(R(I).NE.0.) WRITE(6,34100)(DP(I,J),J=1,5),R(I)               00013180
1322    3611 CONTINUE                                                         00013190
1323   34100 FORMAT(T6,5A4,T52,F8.3)                                          00013200
1324          WRITE(8,33001)                                                  00013210
1325   33001 FORMAT(/T6,'DURING CURE')                                        00013220
1326          DO 3612 I=30,33                                                 00013230
1327          IF(R(I).NE.0.)WRITE(8,34100)(DP(I,J),J=1,5),R(I)                00013240
1328    3612 CONTINUE                                                         00013250
1329          WRITE(6,33002)                                                  00013260
1330   33002 FORMAT(/T6,'AFTER CURE')                                         00013270
1331          DO 3613 I=34,46                                                 00013280
1332          IF(R(I).NE.0.)WRITE(8,34100)(DP(I,J),J=1,5),R(I)                00013290
1333    3613 CONTINUE                                                         00013300
1334          GO TO 3700                                                      00013310
1335    3620 WRITE(6,34001)(DP(47,J),J=1,5),R(47)                             00013320
1336          WRITE(6,33000)                                                  00013330
1337          DO 3625 I=48,51                                                 00013340
1338          IF(R(I).NE.0.) WRITE(6,34100)(DP(I,J),J=1,5),R(I)               00013350
1339    3625 CONTINUE                                                         00013360
1340          WRITE(6,33001)                                                  00013370
1341          DO 3621 I=52,56                                                 00013380
1342          IF(R(I).NE.0.) WRITE(6,34100)(DP(I,J),J=1,5),R(I)               00013390
1343    3621 CONTINUE                                                         00013400
1344          WRITE(6,33002)                                                  00013410
1345          DO 3622 I=57,60                                                 00013420
1346          IF(R(I).NE.0.) WRITE(6,34100)(DP(I,J),J=1,5),R(I)               00013430
1347    3622 CONTINUE                                                         00013440
1348    C                                                                     00013450
1349    3700 WRITE(6,24100)SUMT2,SUMT1                                        00013460
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1350  C                                                                      00013470
1351   3960 CONTINUE                                                         00013480
1352  C                                                                      00013490
1353        RETURN                                                           00013500
1354   9999 STOP                                                           00013510
1355        END                                                              00013520
1356  C                                                                      00013530
1357  C                                                                      00013540
1358  C                                                                      00013550
1359  C                                                                      00013560
1360        SUBROUTINE FINISH(IN4)                                           00013570
1361        INTEGER*4 IH(3)                                                  00013580
1362        DIMENSION OP(60,5),PART(2,5),A(60,3),R(60),S(60),SUM(5,2),       00013590
1363       *          RH(16),ST(16),B(7),C(16),AB(6,3),DIM(2),PNUM(5)       00013600
1364        COMMON /X/OP,SUM,K,S,PART                                        00013610
1365       *       /XX/A                                                     00013620
1366       *       /X34/PNUM                                                 00013630
1367  C                                                                      00013640
1368  C                                                                      00013650
1369  23000 FORMAT(//T6,'FACTORY STANDARD HOURS',T40,'SET-UP',T55,'RUN',     00013660
1370       *       /T6,28('-'),T39,8('-'),T52,8('-'),/)                      00013670
1371  24000 FORMAT(T6,5A4,T39,F6.3,T52,F8.3)                                 00013680
1372  24100 FORMAT(/T6,'TOTAL HOURS',T39,F8.3,T52,F8.3,/T39,8('*'),T52,8('*'))00013690
1373  C                                                                      00013700
1374  C READ OPERATION AND COEFFICIENTS                                      00013710
1375        DO 400 I=1,9                                                     00013720
1376    400 READ(4,40000) (OP(I,J),J=1,5),(A(I,J),J=1,2),C(I)                00013730
1377  40000 FORMAT(T1,5A4,T31,F8.6,T41,F8.6,T51,F8.6,T61,F8.6,T71,F8.6)      00013740
1378        DO 401 I=10,15                                                   00013750
1379    401 READ(4,40000) (OP(I,J),J=1,5),(A(I,J),J=1,3),B(I-9),C(I)         00013760
1380        DO 402 I=1,6                                                     00013770
1381    402 READ(4,40002)(AB(I,J),J=1,3)                                     00013780
1382  40002 FORMAT(T1,F8.6,T11,F8.6,T21,F8.6)                                00013790
1383  C                                                                      00013800
1384        DO 4900 L=1,IN4                                                  00013810
1385  C                                                                      00013820
1386  C READ GENERAL INFORMATION FOR EACH FINISHING OPERATION                00013830
1387        READ(5,40010)((PART(I,J),J=1,5),I=1,2),IQTY4,AFIN                00013840
1388  40010 FORMAT(T1,5A4,5A4,T41,I3,T51,F7.2)                               00013850
1389        DO 410 I=1,16                                                    00013860
1390        R(I)=0.                                                          00013870
```

```
      RH(I)=0.                                                          00013860
      ST(I)=0.                                                          00013890
  410 S(I)=0.                                                           00013900
      SUMT1=0.                                                          00013910
      SUMT2=0.                                                          00013920
C                                                                       00013930
      WRITE(8,40100)(PART(1,J),J=1,5),IQTY4,(PART(2,J),J=1,5),AFIN      00013940
40100 FORMAT('1',//T35,'FINISHING',/T35,9('-'),                         00013950
     *//T6,'PART NAME:  ',5A4,T50,'QTY:  ',I3,                         00013960
     */T6,'PART NUMBER:  ',5A4,T50,'PART AREA:  ',F7.2)                 00013970
      QTY4=FLOAT(IQTY4)                                                 00013980
C                                                                       00013990
      REWIND 11                                                         00014000
  415 READ(11,41011,END=420) (PNUM(J),J=1,5),PERM                       00014010
41011 FORMAT(1X,5A4,2X,F10.2)                                           00014020
      GO TO 430                                                         00014030
  420 WRITE(6,40099)(PART(2,J),J=1,5)                                   00014040
40099 FORMAT(T2,'*** ERROR ** -- PERIMETER FOR PART NO.:  ',5A4,' CANNOT 00014050
     * BE FOUND, PROGRAM ENDED')                                        00014060
      GO TO 9999                                                        00014070
  430 DO 431 I=1,5                                                      00014080
      IF(PART(2,I).NE.PNUM(I)) GO TO 415                                00014090
  431 CONTINUE                                                          00014100
C                                                                       00014110
      WRITE(6,40120) PERM                                               00014120
40120 FORMAT(T6,'PERIMETER:  ',F7.2)                                    00014130
C                                                                       00014140
      READ(5,42000) ICODE,(DIM(I),I=1,2),(IH(I),I=1,2)                  00014150
      IF(ICODE.EQ.0) GO TO 4100                                         00014160
      WRITE(8,41000)                                                    00014170
41000 FORMAT(//T14,'NET TRIM OPERATIONS',/T6,36('-'),                   00014180
     */T14,'MATERIAL(IN.)',/T13,14('-'),                                00014190
     */T14,'AVE.',T22,'TRIM',/T6,'CODE',T13,'THICK.  LENGTH   FIXT.  TEM00014200
     *P.',/T6,'----   ------  ------   -----  -----')                  00014210
      GO TO 4002                                                        00014220
C                                                                       00014230
C NET TRIM OPERATION                                                    00014240
C                                                                       00014250
 4000 READ(5,42000) ICODE,(DIM(I),I=1,2),(IH(I),I=1,2)                  00014260
42000 FORMAT(T1,I1,T11,F7.2,T21,F7.2,T31,2I1)                           00014270
      IF(ICODE.EQ.0) GO TO 4100                                         00014280
```

```
1432   4002 WRITE(8,42001) ICODE,(DIM(I),I=1,2),(IH(I),I=1,2)                  00014290
1433  42001 FORMAT(T6,I1,T12,F7.2,T20,F7.2,T32,I1,T39,I1)                      00014300
1434        IF(DIM(1).EQ.0.) DIM(1)=1.                                        00014310
1435        IF(ICODE.EQ.9) DIM(2)=1.                                          00014320
1436        RR=A(ICODE,1)*DIM(2)*DIM(1)**A(ICODE,2)                           00014330
1437        R(ICODE)=R(ICODE)+RR                                              00014340
1438        RH(ICODE)=RH(ICODE)+(AB(1,1)*AFIN**AB(1,2))                       00014350
1439        IF(IH(1).EQ.1) RH(ICODE)=RH(ICODE)+(AB(2,1)*AFIN**AB(2,2))+AB(2,3)00014360
1440        IF(IH(2).EQ.1) RH(ICODE)=RH(ICODE)+(AB(4,1)*AFIN**AB(4,2))        00014370
1441        IF(IH(1).EQ.1.OR.IH(2).EQ.1) RH(ICODE)=RH(ICODE)+                 00014380
1442       *                                AB(5,1)*PERM                      00014390
1443        GO TO 4000                                                        00014400
1444  C                                                                       00014410
1445  C HOLE OPERATION                                                        00014420
1446  C                                                                       00014430
1447   4100 READ(5,42100) ICODE,IQTY4A,(DIM(I),I=1,2),(IH(I),I=1,3)           00014440
1448        IF(ICODE.EQ.0) GO TO 4210                                         00014450
1449        WRITE(8,41100)                                                    00014460
1450  41100 FORMAT(//T25,'HOLE OPERATIONS',/T6,50('-'),/T20,'HOLE DIM.(IN.)',/00014470
1451       *T14,'QTY ',T20,14('-'),T52,'NO.',/T6,'CODE   PART    DIAM.   DEPTH00014480
1452       *   FIXT.  TEMP.  INSRT',                                          00014490
1453       * /T6,'----   ----   ------ ------   -----  -----  -----',/)       00014500
1454        GO TO 4201                                                        00014510
1455  C                                                                       00014520
1456   4200 READ(5,42100) ICODE,IQTY4A,(DIM(I),I=1,2),(IH(I),I=1,3)           00014530
1457  42100 FORMAT(T1,I1,T11,I3,T21,F7.4,T31,F7.4,T41,I1,2I1)                 00014540
1458        IF(ICODE.EQ.0) GO TO 4210                                         00014550
1459   4201 WRITE(8,42101)ICODE,IQTY4A,(DIM(I),I=1,2),(IH(I),I=1,3)           00014560
1460  42101 FORMAT(T6,I1,T13,I3,T21,F6.4,T29,F6.4,T39,I1,T46,I1,T53,I1)       00014570
1461        QTY4A=FLOAT(IQTY4A)                                               00014580
1462  C                                                                       00014590
1463        ICOD=ICODE+9                                                      00014600
1464        IF(DIM(1).EQ.0.) DIM(1)=1.                                        00014610
1465        IF(DIM(2).EQ.0.) DIM(2)=1.                                        00014620
1466        RR=A(ICOD,1)*(DIM(1)**A(ICOD,2))*(DIM(2)**A(ICOD,3))+B(ICODE)     00014630
1467        RR=RR*QTY4A                                                       00014640
1468        R(ICOD)=R(ICOD)+RR                                                00014650
1469        RH(ICOD)=RH(ICOD)+(AB(1,1)*AFIN**AB(1,2))                         00014660
1470        IF(IH(1).EQ.1.OR.IH(1).EQ.2)                                      00014670
1471       * RH(ICOD)=RH(ICOD)+AB(IH(1)+1,1)*AFIN**AB(IH(1)+1,2)+AB(IH(1)+1,3)00014680
1472        IF(IH(2).EQ.1) RH(ICOD)=RH(ICOD)+(AB(4,1)*AFIN**AB(4,2))          00014690
```

```
      IF(IP(1).EQ.1.OR.IP(1).EQ.2.OR.IH(2).EQ.1)                        00014700
     *       RH(ICOD)=RH(ICOD)+AB(5,1)*PERM                             00014710
      IF(IP(3).GT.0) RH(ICOD)=RH(ICOD)+(AB(6,1)+AB(6,2)*FLOAT(IP(3)))   00014720
      GO TO 4200                                                        00014730
C                                                                       00014740
 4210 DO 4220 I=1,16                                                    00014750
      R(I)=R(I)*QTY4                                                    00014760
      RH(I)=RH(I)*QTY4                                                  00014770
      IF(R(I).NE.0.) S(I)=C(I)                                          00014780
      ST(I)=R(I)+RH(I)                                                  00014790
      SUMT2=SUMT2+ST(I)                                                 00014800
 4220 SUMT1=SUMT1+S(I)                                                  00014810
      SUM(4,1)=SUMT1+SUM(4,1)                                           00014820
      SUM(4,2)=SUMT2+SUM(4,2)                                           00014830
C                                                                       00014840
C OUTPUT                                                                00014850
C                                                                       00014860
      WRITE(8,43000)                                                    00014870
43000 FORMAT('1',//T35,'FINISHING',/T35,9('-'))                         00014880
      WRITE(6,23000)                                                    00014890
      WRITE(8,43010)                                                    00014900
43010 FORMAT(T6,'NET TRIM OPERATIONS')                                  00014910
43003 FORMAT(T8,5A4,T39,F6.3,T52,F8.3)                                  00014920
      DO 4300  I=1,9                                                    00014930
      IF(R(I).EQ.0.) GO TO 4300                                         00014940
      WRITE(8,43003) (OP(I,J),J=1,5),S(I),R(I)                          00014950
      WRITE(8,43001) RH(I)                                              00014960
      WRITE(8,43002) ST(I)                                              00014970
43001 FORMAT(T8,'HANDLING',T52,F8.3)                                    00014980
43002 FORMAT(T10,'SUBTOTAL',T52,F8.3)                                   00014990
 4300 CONTINUE                                                          00015000
      WRITE(6,43011)                                                    00015010
43011 FORMAT(/T6,'HOLE OPERATIONS')                                     00015020
      DO 4301 I=10,15                                                   00015030
      IF(R(I).EQ.0.) GO TO 4301                                         00015040
      WRITE(8,43003) (OP(I,J),J=1,5),S(I),R(I)                          00015050
      WRITE(6,43001) RH(I)                                              00015060
      WRITE(6,43002) ST(I)                                              00015070
 4301 CONTINUE                                                          00015080
      WRITE(6,24100) SUMT1,SUMT2                                        00015090
 4900 CONTINUE                                                          00015100
```

```
      C                                                                 00015110
            RETURN                                                      00015120
       9999 STOP                                                        00015130
            END                                                         00015140
      C                                                                 00015150
      C                                                                 00015160
      C                                                                 00015170
      C                                                                 00015180
            SUBROUTINE TND(L,K)                                         00015190
            DIMENSION TN(5,3),T11(5,2),SLP1(5,2),SLPB1(5,2),T1(5),SLP(5),00015200
           *          SLPB(5),HR(5)                                     00015210
            COMMON /X5/TN,T1,T11,SLP1,SLPB1,SLP,SLPB,HR,IUNIT           00015220
      C                                                                 00015230
            SLPB1(L,1)=ALOG(SLP1(L,1)/100.)/ALOG(2.)                    00015240
            SLPB1(L,2)=ALOG(SLP1(L,2)/100.)/ALOG(2.)                    00015250
      C                                                                 00015260
            IF(IUNIT.GT.K) GO TO 10                                     00015270
            K1=IUNIT                                                    00015280
            K2=0                                                        00015290
            I1=1                                                        00015300
            GO TO 20                                                    00015310
      C                                                                 00015320
         10 K1=K                                                        00015330
            K2=K+1                                                      00015340
            I1=2                                                        00015350
      C                                                                 00015360
         20 TN(L,1)=T11(L,I1)*FLOAT(IUNIT)**SLPB1(L,I1)*HR(L)           00015370
            TT=0.                                                       00015380
            DO 30 I=1,K1                                                00015390
            TTT=T11(L,1)*FLOAT(I)**SLPB1(L,1)                           00015400
         30 TT=TT+TTT                                                   00015410
            IF(K2.EQ.0) GO TO 40                                        00015420
            DO 35 I=K2,IUNIT                                            00015430
            TTT=T11(L,2)*FLOAT(I)**SLPB1(L,2)                           00015440
         35 TT=TT+TTT                                                   00015450
      C                                                                 00015460
         40 TN(L,3)=TT*HR(L)                                            00015470
            TN(L,2)=TN(L,3)/FLOAT(IUNIT)                                00015480
      C                                                                 00015490
            T1(L)=T11(L,I1)                                             00015500
            SLP(L)=SLP1(L,I1)                                           00015510
```

```
      SLPP(L)=SLPB1(L,II)                                              00015520
C                                                                      00015530
      RETURN                                                           00015540
      END                                                              00015550
C                                                                      00015560
C                                                                      00015570
      FUNCTION PCON(A,B)                                               00015580
      DIMENSION APAR1(10),APAR2(10),IQTY(10)                           00015590
      COMMON /X3/APAR1,APAR2,IQTY,NOP                                  00015600
C                                                                      00015610
      PARTS=0.                                                         00015620
      DO 10 I=1,NOP                                                    00015630
      PART=APAR1(I)**B*FLOAT(IQTY(I))                                  00015640
   10 PARTS=PARTS+PART                                                 00015650
      PCON=PARTS*A                                                     00015660
      RETURN                                                           00015670
      END                                                              00015680
```

APPENDIX B. PERMANENT INPUT DATA SETS

The constants used in calculations performed by the program as well as some of the identifying labels printed in the output are contained in five Permanent Input Data Sets. The organization of Data Sets allows convenient access for reference purposes, or in case changes need to be made. The constants or the labels may be changed by editing the Data Sets, without disturbing the program instructions.

Four of the Data Sets provide the data for Factory Labor Standards Estimating in each of the subroutines; the fifth provides data for Support Functions Estimating and Cost Projection in the main program.

LAYUP DATA SET

POSITION	RECORD				
1	CLEAN LAYUP TOOL			0.000006	1.0
2	APPLY RELEASE AGENT			0.000009	1.0
3	POSITION MYLAR			0.000107	0.77006
4	PLY DEPOSITION			0.	0.
5	STACK TO FORM BUCK			0.000145	0.6711
6	TRANS TO LAYUP TOOL			0.000145	0.6711
7	CLEAN CURING TOOL			0.000006	1.0
8	APPLY RELEASE AGENT			0.000009	1.0
9	TRANS TO CURING TOOL			0.000145	0.6711
10	SEWING HANDLING			0.0005	0.4382
11	STRAIGHT SEWING			0.0005	0.0001
12	CONTOUR SEWING			0.0010	0.0001
13	RADIAL SEWING			0.0015	0.0001
14	DEBULKING (DISP BAG)			0.00175	0.6911
15	DEBULKING (REUS BAG)			0.000557	0.8150
16	GRAPHITE--3" TAPE			0.0004	87.
17	GRAPHITE--12" TAPE			0.0004	87.
18	GRAPHITE--WOVEN			0.00086	43.
19	FIBERGLASS--3" TAPE			0.00054	8.7
20	FIBERGLASS--12" TAPE			0.00054	8.7
21	FIBERGLASS--WOVEN			0.00104	9.3
22	00.00007	0.	0.		
23	00.00016	0.	0.		
24	0.	0.	0.		
25	00.00047	-1.35645	0.		
26	00.015	-0.5537	0.7456		
27	00.00641	-0.5379	0.5178		
28	00.00444	-0.54576	0.00007		
29	00.00140	00.6016	00.05		
30	00.00027	00.64654	00.10		
31	00.00657	0.0	00.15		
32	00.00063	00.4942	00.15		
33	00.00058	00.57164	00.15		
34	00.00188	00.3894	0.		
35	00.00145	00.8245	00.05		
36	00.00154	00.58746	00.10		
37	00.00076	00.6295	00.05		
38	0.	0.	0.		
39	0.	0.	0.		
40	0.	0.	0.		

CORE PREPARATION DATA SET

POSITION	RECORD			
1	SAWING	0.000663	0.423	0.05
2	SAWING HANDLING	0.000453	0.381	
3	POLYGLYCOL	0.00257	0.6175	0.02
4	FLAT MACHINING	0.00013	0.0008	0.50
5	FLAT HANDLING	0.002657	0.5051	
6	CONTOUR MACHINING	0.002	0.012	0.60
7	CONTOUR HANDLING	0.002657	0.5051	
8	STEP CUT MACHINING	0.0006		0.11
9	STEP CUT HANDLING	0.002657	0.5051	
10	SCARF CUT MACHINING	0.0006		0.11
11	SCARF CUT HANDLING	0.002657	0.5051	
12	BLENDING MACHINING	0.0009		0.11
13	BLENDING HANDLING	0.002657	0.5051	
14	CUTOUT MACHINING	0.0120		0.01
15	CUTOUT HANDLING	0.002657	0.5051	
16	HAND FORMING	0.000008	1.266	0.05
17	BRAKE FORMING(.1250)	0.0091		0.15
18	BRAKE FORMING(.1875)	0.0065		0.19
19	BRAKE FORMING(.2500)	0.0052		0.12
20	BRAKE F(.3125-.3750)	0.0039		0.03
21	BRAKE FORM HANDLING	0.0008	0.5268	
22	LIQUID POTTING	0.0105		0.05
23	TAPE FOAMING	0.0257		0.05
24	CORE CLEANING	0.00046	0.4257	0.05

PART CONSOLIDATION DATA SET

POSITION	RECORD				
1	SET UP	0.05	0.05		0 0
2	APPLY ADHESIVE	0.000055			0 0
3	HANDLING	0.00150	0.6311		0 0
4	SET UP	0.07	0.05		1 1
5	PREFIT DETAILS	0.001326	0.5252		5 5
6	APPLY ADHESIVE	0.000055			1 1
7	ASSEMBLE DETAILS	0.000145	0.6711		5 5
8	APPLY POROUS FILM	0.000009	1.000000		4 4
9	APPLY BLEEDER PLIES	0.00002			1 1
10	APPLY NONPOROUS FILM	0.000009	1.000000		4 4
11	APPLY VENT CLOTH	0.00002	1.000000		4 4
12	INSTALL VACUUM FTGS	0.0062			2 0
13	INSTALL THERMOCPLS	0.0162			2 2
14	APPLY SEAL STRIPS	0.00016			3 0
15	APPLY DISPOSABLE BAG	0.000006	1.000000		4 0
16	SEAL EDGES	0.00054			3 0
17	APPLY REUSABLE BAG	0.000011	1.000000		0 4
18	CLAMP EDGES	0.00023			0 3
19	CONNECT VACUUM LINES	0.0061	0.0061		1 1
20	SMOOTH BAG DOWN	0.000006	1.000000		4 4
21	CHECK SEALS	0.00017			3 3
22	REMOVE VACUUM LINE	0.0031	0.0031		1 1
23	CHECK CHAMBER INT.	0.03	0.03		1 1
24	LOAD LAYUP IN OVEN	0.000114	0.8566		0 4
25	LOAD LAYUP IN AUTO.	0.000145	0.6711	0.0250	4 0
26	CONNECT VACUUM LINES	0.0061			2 2
27	CONNECT T.C. LEADS	0.0092			2 2
28	CHECK FOR LEAKS	0.000006	0.00027	0.0068	4 4
29	CLOSE DOOR	0.0192	0.0192		1 1
30	SET RECORDERS	0.0140	0.0035		1 1
31	CYCLE CHECK	0.0800	0.0800		1 1
32	SHUT DOWN	0.00332	0.00083		1 1
33	REMOVE CHARTS	0.00332	0.00083		1 1
34	OPEN DOOR	0.0192	0.0192		1 1
35	RELEASE T.C. LEADS	0.0035			2 2
36	RELEASE VAC. LINES	0.0031			2 2
37	REMOVE PART FR OVEN	0.000114	0.8566		0 4
38	REMOVE PART FR AUTO.	0.000145	0.6711	0.0120	4 0
39	RELEASE CLAMPS	0.00007	0.120		0 3
40	REMOVE REUS. BAG	0.000008	1.000000		0 4
41	REMOVE DISP. BAG	0.000003	1.000000		4 0
42	REMOVE THERMOCOUPLES	0.0095			2 2
43	REMOVE VACUUM FTGS	0.0029			2 0
44	REMOVE PROCESS MATL	0.000019	1.000000	0.000014	4 4
45	REMOVE LAYUP & ASIDE	0.000006	1.000000		4 4
46	CLEAN TOOL	0.000006	1.000000		4 4
47	SET UP	0.45	0.05		1 1
48	FIT LAYUPS INTO MOLD	0.00237	0.06083	0.00160	5 5
49	CHECK OVEN INTERIOR	0.03	0.03		0 1
50	LOAD CAGE INTO OVEN	0.00114	0.8566		0 3
51	CLOSE DOOR	0.0192	0.0192		0 1
52	CURE IN HEATING ELEM	0.00264	0.3207		5 0
53	SET RECORDER	0.0035	0.0035		0 1
54	CYCLE CHECK	0.0800	0.0800		0 1
55	SHUT DOWN	0.0083	0.0083		0 1
56	REMOVE CHARTS	0.0083	0.0083		0 1
57	OPEN DOOR	0.0192	0.0192		0 1
58	REMOVE CAGE FR OVEN	0.00114	0.8566		0 3
59	REMOVE PART FR CAGE	0.000145	0.6711	0.000253	5 5
60	ASIDE PART	0.000043	0.5965		5 5

FINISHING DATA SET

POSITION	RECORD						
1	HAND ROUTING		0.0067	0.9219	0.05		
2	MACHINE ROUTING		0.0015	0.	0.20		
3	HAND SAWING		0.0046	0.6624	0.02		
4	MACHINE SAWING		0.0022	0.6744	0.05		
5	HAND SANDING		0.0005	0.	0.02		
6	PORT. TOOL SANDING		0.00120	1.	0.02		
7	MACHINE SANDING		0.00046	0.	0.25		
8	GRINDING		0.00046	0.	0.25		
9	SHEARING		0.0016	0.	0.05		
10	DRILLING		0.01643	0.3370	0.4562	0.0006	0.05
11	REAMING		0.01218	0.2747	0.8330	0.0006	0.05
12	COUNTERSINKING		0.0045	0.7250	0.	0.0006	0.05
13	COUNTERBORING		0.00514	0.5966	0.2750	0.0006	0.05
14	HOLE SAWING		0.01293	0.	1.10151	0.0006	0.05
15	HOLE PUNCHING		0.	0.	0.	0.0036	0.05
16	0.000145	0.6711					
17	0.00414	0.3264	0.0044				
18	0.00777	0.2694	0.0044				
19	0.000107	0.7706e					
20	0.000322	0.					
21	0.0006	0.0001					

COST PROJECTION DATA SET

POSITION	RECORD						
1	LAYUP		34.03	23.24	65.81	76.63	
2	HONEYCOMB CORE PREP		1.3970	15.4359	0.0	0.0	
3	PART CONSOLIDATION		36.48	25.06	65.77	76.52	
4	FINISHING OPERATIONS		35.19	23.84	65.82	76.77	
5	TOTAL FACTORY LABOR		0.	0.			
6	FACTORY LABOR	1 1	1.	0.	0.	0.	10.
7	QUALITY CONTROL	1 1	0.4243	-0.1737	0.3542	-0.2285	10.
8	TOOLING	1 1	0.703	-0.2594	0.6313	-0.4196	10.
9	MFG ENGINEERING	1 1	0.7227	-0.1826	1.0062	-0.4256	10.
10	ENGINEERING	1 1	0.354	-0.2223	0.3524	-0.3713	10.
11	GRAPHIC SERVICES	1 1	0.0824	-0.2298	0.0432	-0.1840	10.
12	PRODUCTION MATERIAL	1 1	1.	0.			
13	SUPPORT MATERIAL	7 2	0.30	0.			
14	MFG. ALLOWANCE		0.02				
15	1.50						
16	1.50						
17	1.50						
18	1.50						
19	1.70						
20	1.70						
21	0.						
22	.70						
23	.15						

APPENDIX C. JOB CONTROL LANGUAGE

The Job Control Language (JCL) for the ACCEM computer program provides allocation of several data sets. The files which are required are described below.

FILE NO.	DESCRIPTION	RECORD LENGTH
1 - 4	Permanent Input Data Set - May be read in from cards or may be installed as permanent data sets	80
5	Variable Input Data Set	80
6	Output Data Set (program status information)	132
8	Output Data Set (information for printing final output)	132
9	Permanent Input Data Set - May be read in from cards or may be installed as permanent data sets	80
10-11	Scratch Space	80

The JCL used to run the ACCEM program on Northrop's IBM 370/165 computer is presented on the next page.

```
//ACCEM EXEC FØRTXCLG,REGIØN.GØ=100K
//FØRT.SYSIN DD *
      |PRØGRAM LISTING|
//GØ.FT01F001 DD *
      |ACCEM 1  LAYUP DATA|
//GØ.FT02F001 DD *
      |ACCEM 2  CØRE PREPARATIØN DATA|
//GØ.FT03F001 DD *
      |ACCEM 3  PART CØNSOLIDATIØN DATA|
//GØ.FT04F001 DD *
      |ACCEM 4  FINISHING DATA|
//GØ.FT09F001 DD *
      |ACCEM 5  CØST PRØJECTIØN DATA|
//GØ.FT10F001 DD UNIT=SYSDA,SPACE=(CYL,(1,1))
//GØ.FT11F001 DD UNIT=SYSDA,SPACE=(CYL,(L,L))
//GØ.FT08F001 DD SYSØUT=A
//GØ.FT06F001 DD SYSØUT=A
//GØ.FT05F001 DD *
      |INPUT DATA|
/*
```

APPENDIX D. SAMPLE ESTIMATES

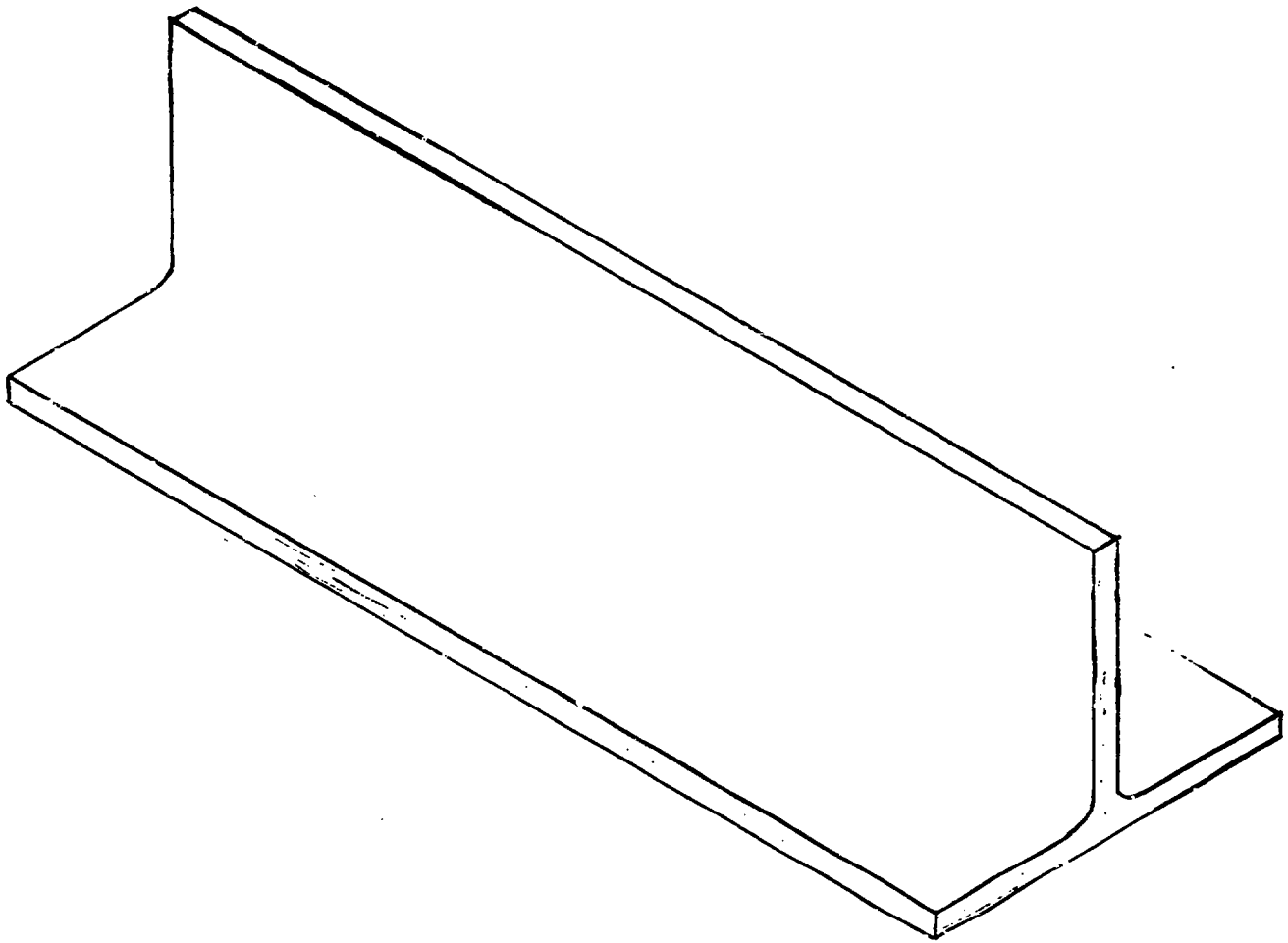
Four sample estimates have been prepared to demonstrate the employment of the ACCEM computerized system. For each estimate, a sketch of the part and a manufacturing plan supply the part, material, and fabrication process data necessary to fill out the forms. The completed forms and the resulting computer outputs are included to represent complete execution of the estimating cycle.

LOWER LONGERON (SR-001921-19)

DESCRIPTION

The lower longeron component consists of two graphite/epoxy 20 ply thick "L" shaped legs with a moldline contoured 20 ply thick graphite/epoxy strap. Also included in this structure is a wedge shaped precast epoxy filled assembly which acts as a tooling aid and becomes an integral part of the finished lower longeron component. The total longeron structure is formed in one operation through the cocuring of both "L" shaped legs and the graphite strap in one curing cycle as outlined in the detail manufacturing plan, and discussed in the following paragraphs.

The tooling concept utilized in the fabrication of the lower longeron elements consisted of: (1) a thin steel brake formed curing (moldline) surface welded to a steel carriage frame; and (2) two brake formed angle tools for laying up and curing of the "L" shaped leg components. One of the brake formed angles incorporated a top flange to prevent longeron distortion during the cocuring cycle.



LOWER LONGERON (SR-001921-19)

The 20 ply "L" shaped graphite/epoxy components were layed up in the flat in five ply books, subsequently draped and formed over the brake formed angle tools with each succeeding book being layed and formed over the preceding book until the total 20 ply component was layed up. The 20 ply graphite/epoxy moldline strap was then layed up on the contoured moldline cocuring tool and formed to this shape. The precast epoxy assembly was located on the graphite strap and resin tacked in place. The "L" shaped graphite assemblies were positioned on either side of the epoxy casting making intimate contact with this casting and the graphite strap assembly providing a "T" shaped component. No structural adhesive was required between these assemblies as resin bonding was accomplished in these areas during the cocuring operation. The completed assembly was then vacuum bagged using a reusable rubber vacuum bag and cocured in one operation in an autoclave at 50 psi (full vacuum + 35 psi autoclave pressure) for two hours at 300° F with no resin bleeding being accomplished. The assembly after the cocuring cycle exhibited excellent dimensional tolerances and configuration stability. The components were then net trimmed, subjected to quality assurance evaluations and set aside for subsequent joining operations to the lower fuselage and equipment deck assemblies.

MANUFACTURING PLAN

1. The following list of detail parts makes up the lower longeron assembly.
    a. Upper composite angle (-77).
    b. Lower composite angle (-77).
    c. Composite strap (-79).
2. Materials
    a. Thornel 300/SP288 graphite/epoxy - per NAI-1332.

3. Layup and Cocure of Graphite/Epoxy Lower Longeron

a. The 20 plies required by drawing SR-001921 shall be layed up in five books. Each book shall be transferred to the brake-formed tool, and layup shall continue until the buildup of all plies is completed and the two composite angles have been layed up.

b. The -77 composite angles shall be set aside for subsequent cocuring operations.

c. The No. 1 composite ply (0°) of the composite strap (-79) shall be layed up on the previously released (FreKote 33) lower longeron cocuring tool per drawing SR-001921. This operation shall be repeated until the buildup of all the plies is completed.

d. The fiberglass reinforced filler casting shall be wrapped with a layer of structural adhesive (FM-123-5), positioned on the -79 composite strap and adhesively tacked in place.

e. The -77 composite angles shall be positioned on either side of the fiberglass reinforced epoxy filler casting and on top of the -79 composite strap and resin tacked in place. No structural adhesive is required between the -77 composite angles and -79 composite strap as resin bonding is accomplished during the cocuring operation.

f. Apply a layer of non-porous armalon over the entire layup and drape to shape of component.

g. Apply two layers of Osnaburg breather cloth over the layup and drape to shape. Do not resin bleed the composite longeron.

h. The component shall be vacuum bagged using the reusable rubber vacuum bag, and cocured at 50 psi (full vacuum + 35 psi autoclave pressure) with a cure temperature of two hours at 300°F as monitored by thermocouples.

i. Upon removal of the component from the bag, it will be exposed and checked for conformity to previously determined dimensions; any discrepancy shall be recorded.

j. The component shall be next trimmed to final dimensions and delivered to Quality Control.

k. Quality Control shall map all detectable voids and retain this record as part of the inspection record.

ACCEM-0 INPUT CHECKLIST

CARD 1

ESTIMATOR NAME	[1] D.J. LEBLANC
ESTIMATE NUMBER	[21] PRELIM-12
PART NAME	[41] LOWER LONGERON
PART NUMBER	[61] SR00921-19

CARD 2

INPUT FORMS		QUANTITY USED
ACCEM-1	LAYUP	[0.2]
ACCEM-2	HONEYCOMB CORE PREPARATION	[3] 0.0
ACCEM-3	PART CONSOLIDATION	[5] 0.1
ACCEM-4	FINISHING OPERATIONS	[7] 0.1
ACCEM-5	COST PROJECTION	[9] 0.1

ACCEM-1 LAYUP

CARD 1 PART NAME ANGLE | PART NUMBER -77 | QTY 4

TRIM ALLOWANCE 51 IN.

LAYUP TOOL SAME AS CURING TOOL (CIRCLE ONE) YES 1 NO 2 61

DEBULKING NUMBER OF OCCURRENCES 62 64

TYPE OF BAG (CIRCLE ONE) DISPOSABLE 1 REUSABLE 2 64

CARD 2 (BLANK)

CARD 3

	GRAPHITE TAPE	GRAPHITE WOVEN	FIBERGLASS TAPE	FIBERGLASS WOVEN
COST ($/LB)	20	11	21	31
DENSITY (LB/SQ.IN.)	41	51	61	71

KEYPUNCH CARD 4 AND CARD 5 ALTERNATELY

CARD 4

METHOD	BEND DESCRIPTION				
	QUANTITY OF PREPLIES	TYPE OF BEND	BEND LENGTH (IN.)	RADIUS OF CURVATURE	FLANGE WIDTH (IN.)
1	1	1	60		
9999					

CARD 5

PLY DESCRIPTION								
		DIMENSIONS					MATERIAL	
ORIENTATION (DEG.)	COUNT	RECTANGULAR		NONRECTANGULAR			TYPE	WIDTH
		LENGTH (IN.)	WIDTH (IN.)	AREA (SQ.IN.)	DISTANCE (IN.)			
000	001	60	6				1	3
045	001							
090	001							
000								

LAST ENTRY ON CARD 4 IS "9999"; LAST ENTRY ON CARD 5 IS "000"

LEGEND

HANDLING METHOD:	1 = PREPLY, 2 = DIRECT-ON-TOOL
LAYUP METHOD:	1 = MANUAL, 2 = HAND-ASSIST, 4 = CONRAC AUTOMATIC (720 IPM), 5 = CONRAC AUTOMATIC (360 IPM)
DEPOSITION TECHNIQUE:	1 = PLY-ON-PLY, 2 = PLY-ON-MYLAR
TYPE OF BEND:	1 = STRAIGHT, SHARP, MALE, 2 = STRAIGHT, SHARP, FEMALE; 3 = STRAIGHT, RADIAL MALE; 4 = STRAIGHT, RADIAL, FEMALE; 5 = CURVED, STRETCH FLANGE (TAPE); 6 = CURVED, SHRINK FLANGE (TAPE); 7 = CURVED (WOVEN MATERIAL)
MATERIAL FORM:	1 = UNIDIRECTIONAL TAPE, 2 = WOVEN
MATERIAL TYPE:	1 = GRAPHITE/EPOXY, 2 = FIBERGLASS/EPOXY

ACCLM-1 LAYUP

CARD 1 PART NAME STRAP (1) PART NUMBER -79 (21) QTY 002 (31)

TRIM ALLOWANCE (51) IN.

LAYUP TOOL SAME AS CURING TOOL (CIRCLE ONE) YES 0 (61) NO 1

DEBULKING NUMBER OF OCCURRENCES (62)

TYPE OF BAG (CIRCLE ONE) DISPOSABLE 1 REUSABLE 2 (64)

CARD 2 (BLANK)

CARD 3

	GRAPHITE TAPE	GRAPHITE WOVEN	FIBERGLASS TAPE	FIBERGLASS WOVEN
COST ($/LB) (41)	20	(11)	(21)	(31)
DENSITY (LB/SQ.IN.) (41)		(51)	(61)	(71)

KEYPUNCH CARD 4 AND CARD 5 ALTERNATELY

CARD 4

METHOD	BEND DESCRIPTION					PLY DESCRIPTION									
								DIMENSIONS							
HANDLING METHOD	QUANTITY OF PREPLIES	DEPOSITION TECHNIQUE	LAYUP METHOD	TYPE OF BEND	BEND LENGTH (IN.)	RADIUS OF CURVATURE	FLANGE WIDTH (IN.)	ORIENTATION (DEG.)	COUNT	RECTANGULAR		NONRECTANGULAR		MATERIAL	
										LENGTH (IN.)	WIDTH (IN.)	AREA (SQ.IN.)	DISTANCE (IN.)	FORM	WIDTH
(1)	(2)	(4)	(5)	(6)	(11)	(21)	(31)	(41)	(51)	(11)	(21)	(31)	(41)	(51)	(71)
9999								000							

LAST ENTRY ON CARD 4 IS "9999"; LAST ENTRY ON CARD 5 IS "000"

LEGEND

HANDLING METHOD: 1 = PREPLY, 2 = DIRECT-ON-TOOL

LAYUP METHOD: 1 = MANUAL, 2 = HAND-ASSIST, 4 = CONRAC AUTOMATIC (720 IPM), 5 = CONRAC AUTOMATIC (360 IPM)

DEPOSITION TECHNIQUE: 1 = PLY-ON-PLY, 2 = PLY ON MYLAR

TYPE OF BEND: 1 = STRAIGHT, SHARP, MALE, 2 = STRAIGHT, SHARP, FEMALE; 3 = STRAIGHT, RADIAL MALE; 4 = STRAIGHT, RADIAL FEMALE; 5 = CURVED, STRETCH FLANGE (TAPE); 6 = CURVED, SHRINK FLANGE (TAPE); 7 = CURVED (CLOTH MATERIAL)

MATERIAL FORM: 1 = UNIDIRECTIONAL TAPE, 2 = WOVEN

MATERIAL TYPE: 1 = GRAPHITE/EPOXY, 2 = FIBERGLASS/EPOXY

ACCEM-3 PART CONSOLIDATION

CYCLE NUMBER 1

CARD 1

PART NAME (1)	PART NUMBER (21)	QUANTITY (61)
LOWER LONGERON	SR001921-19	002

COMPONENT DETAIL PARTS

NUMBER OF LINES USED 02 (MAX 10)

CARD 2

PART NAME (1)	PART NUMBER (21)	QUANTITY (61)
ANGLE	-77	002
STRAP	-79	001

CONSOLIDATION OF DETAILS

CARD 3

ADHESIVE (CIRCLE ONE) NO: (1) YES: 1

APPLICATION AREA: ____ SQ. IN.

ADDITIONAL OPERATIONS (CIRCLE IF APPLICABLE) BONDING: 11 1 SPLICING: 11 2

CURING PROCESS

VACUUM BAGGING

TYPE OF BAG: (CIRCLE ONE) DISPOSABLE: 12 1 REUSABLE: 12 (2)

RESIN BLEED: (CIRCLE ONE) NO: (25) YES: 25 1

PLY-TO-BLEEDER RATIO: 14 ____-TO-1

BAGGING AREA: 21 360 SQ. IN.

SEALING/CLAMPING PERIMETER: 31 252 IN.

THERMAL EXPANSION MOLDING

EXTERNAL MOLD CAGE DIMENSIONS: LENGTH: 41 ____ IN.

WIDTH: 51 ____ IN.

DEPTH: 61 ____ IN.

CURING TOOL: (CIRCLE ONE) AUTOCLAVE: 71 1

OVEN: (2)

HEATING ELEMENT: 3

ACCEM-4 FINISHING OPERATIONS

CARD 1 PART NAME (1) LOWER LONGERON (20,21) PART NUMBER S800121-19 (40,41,43) QTY 1001

PART AREA (51) 540.4 SQ. IN.

CARD 2 (OMIT IF LEFT BLANK)
NET TRIM OPERATIONS

OPERATION	AVERAGE THICKNESS (IN.)	TRIM LENGTH (IN.)	TEMPLATE FIXTURE
2	.49	126.4	10
5	.49	126.4	00

CARD 3 0

CARD 4 (OMIT IF LEFT BLANK)
HOLE OPERATIONS

OPERATION	QTY.	HOLE DIAMETER (IN.)	HOLE DEPTH (IN.)	INSERTS TEMPLATE FIXTURE

CARD 5 0

LEGEND

OPERATION: 1 = HAND ROUTING
2 = MACHINE ROUTING
3 = HAND SAWING
4 = MACHINE SAWING
5 = HAND SANDING
6 = PORTABLE TOOL SANDING
7 = MACHINE SANDING

FIXTURE: 0 = NO,
1 = YES

TEMPLATE: 0 = NO
1 = YES

LEGEND

OPERATION: 1 = DRILLING
2 = COUNTERSINKING
3 = COUNTERBORING
4 = REAMING
5 = HOLE SAWING
6 = HOLE PUNCHING

FIXTURE: 0 = NO
1 = EXTERNAL
2 = INTERNAL

TEMPLATE: 0 = NO
1 = YES

INSERTS: 0 = NO
1 = YES

ACCEM-5 COST PROJECTION

CARD 1

UNIT NUMBER 01,000.
AVE. LOT SIZE 10.

TYPE OF ESTIMATE

UNIT COST	COL. 21	NO 0	YES 1 (CIRCLE ONE)
CUMULATIVE AVERAGE COST	COL. 22	NO 0	YES 1 (CIRCLE ONE)
CUMULATIVE TOTAL COST	COL. 23	NO 0	YES 1 (CIRCLE ONE)

CARD 2

FACTORY LABOR PROJECTION FACTORS

LEARNING CURVE: LOG-LINEAR UNIT 1 (col. 24) CUM. AVE. 1 (col. 24) (CIRCLE ONE)

DATA INPUT OPTIONS (CIRCLE ONE) COL. 1
NONE
ITEM (a) - (d) 0
ITEM (e) 1

	CARD 3 T, VARIANCE	CARD 4 LEARNING CURVE SLOPE
(a) LAYUP	13.35	79.4
(b) CORE PREPARATION	7.62	85.6
(c) PART CONSOLIDATION	11.63	80.2
(d) FINISHING OPERATIONS	21.95	76.8
(e) TOTAL FACTORY LABOR		

DATA INPUT OPTIONS (CIRCLE ONE) 2
NONE
ITEMS (a) - (f) 0

LABOR RATES — CARD 5

(a) FACTORY LABOR	10. $/HR
(b) QUALITY CONTROL	12.5 $/HR
(c) TOOLING	14. $/HR
(d) MFG. ENG.	15. $/HR
(e) ENGINEERING	11.75 $/HR
(f) GRAPHIC SERVICES	9. $/HR

DATA INPUT OPTIONS (CIRCLE ONE) 3
NONE
CARDS (6) - (8) 0
CARD (9) 1

SUPPORT FUNCTIONS

	CARD 6 BASE	CARD 7 BASE UNIT	CARD 8 FACTOR	CARD 9 LABOR HRS/MAT'L $'S
QUALITY CONTROL	1	1	.20	
TOOLING	3	1	.12	
MFG. ENG.	4	1	.14	
ENGINEERING	5	1	.10	
GRAPHIC SERVICES	6	1	.05	
SUPPORT MATERIAL	7	2	.25	

LEGEND
BASE: 1 = FACTORY FABRICATION, 2 = QUALITY CONTROL, 3 = TOOLING, 4 = MFG. ENG. 5 = ENGINEERING, 6 = GRAPHIC SERVICES, 7 = PRODUCTION MAT'L
BASE UNIT: 1 = HOURS, 2 = DOLLARS

DATA INPUT OPTIONS (CIRCLE ONE) 4
NONE
ITEMS (a) - (f), (2), (3) 0
ITEMS (1), (2), (3) 1

OVERHEAD RATES — CARD 10

(a) FACTORY FABRICATION	1.90
(b) QUALITY CONTROL	1.2
(c) TOOLING	1.5
(d) MFG. ENG.	1.1
(e) ENGINEERING	1.75
(f) GRAPHIC SERVICES	1.1
(1) TOTAL LABOR	
(2) MATERIAL	
(3) ADMINISTRATIVE	

CARD 11

	.20
	.25

ADVANCED COMPOSITE COST ESTIMATE

ESTIMATOR: D.J. LEBLANC DATE: 09/23/76

ESTIMATE NUMBER: PRELIM-12

PART NAME: LOWER LONGERON

PART NUMBER: S&001921-19

INPUT FORMS	QUANTITY
LAYUP	2
HONEYCOMB CORE OPERATION	0
PART CONSOLIDATION	1
FINISHING OPERATIONS	1
COST PROJECTIONS	1

LAYUP

PART NAME: ANGLE
PART NUMBER: -77
LAYUP TOOL NOT = CURING TOOL

QTY: 4
TRIM ALLOWANCE: 1.00

MATERIAL DATA

	DENSITY	COST
GRAPHITE--3" TAPE	0.000400	20.00
GRAPHITE--12" TAPE	0.000400	20.00
GRAPHITE--WOVEN	0.000880	93.00
FIBERGLASS--3" TAPE	0.000540	8.70
FIBERGLASS--12" TAPE	0.000540	8.70
FIBERGLASS--WOVEN	0.001040	9.30

PLY DESCRIPTION

	BEND DATA							RECT		NON-RECT		MATL		
LD	#P	LH	DT	TB	LENGTH	CR	FW	ORI	CT	LENGTH	WIDTH	AREA	DIST	F	T	WD
1	5	1	1	1	60.00	0.0	0.0	0	2	60.00	6.00	0.0	0.0	1	1	3.
0	0	0	0	0	0.0	0.0	0.0	45	1	60.00	6.00	0.0	0.0	1	1	3.
0	0	0	0	0	0.0	0.0	0.0	90	1	60.00	6.00	0.0	0.0	1	1	3.

LAYUP

FACTORY STANDARD HOURS	SET-UP	RUN
CLEAN LAYUP TOOL	0.0	0.013
POSITION MYLAR	0.0	0.279
PLY DEPOSITION	0.050	5.939
TRANS TO LAYUP TOOL	0.0	0.286
CLEAN CURING TOOL	0.0	0.013
APPLY RELEASE AGENT	0.0	0.020
TRANS TO CURING TOOL	0.0	0.040
SUBTOTAL	0.050	6.591
TOTAL LAYUP	0.050	6.591
	********	********
BEND FACTOR HOURS		0.084

MATERIAL	USAGE (SQ.IN.)	SCRAP (SQ.IN.)	PERCENT SCRAP
GRAPHITE--3" TAPE	42308.16	13508.17	46.90

	WEIGHT	COST
GRAPHITE--3" TAPE	11.52	230.40

LAYUP

PART NAME: STRAP
PART NUMBER: -79
LAYUP TOOL = CURING TOOL

QTY: 2
TRIM ALLOWANCE: 1.00

MATERIAL DATA

	DENSITY	COST
GRAPHITE--3" TAPE	0.000400	20.00
GRAPHITE--12" TAPE	0.000400	20.00
GRAPHITE--WOVEN	0.000880	93.00
FIBERGLASS--3" TAPE	0.000540	8.70
FIBERGLASS--12" TAPE	0.000540	8.70
FIBERGLASS--WOVEN	0.001040	9.30

PLY DESCRIPTION

					BEND DATA					RECT		NON-RECT		MATL		
LD	#P	LH	DT	TB	LENGTH	CR	FW	ORI	CT	LENGTH	WIDTH	AREA	DIST	F	T	WD
2	0	1	2	0	0.0	0.0	0.0	0	10	60.00	6.00	0.0	0.0	1	1	3.
2	0	1	1	0	0.0	0.0	0.0	45	5	60.00	6.00	0.0	0.0	1	1	3.
2	0	1	1	0	0.0	0.0	0.0	90	5	60.00	6.00	0.0	0.0	1	1	3.

LAYUP

FACTORY STANDARD HOURS	SET-UP	RUN
CLEAN LAYUP TOOL	0.0	0.007
APPLY RELEASE AGENT	0.0	0.010
PLY DEPOSITION	0.050	2.969
SUBTOTAL	0.050	2.986
TOTAL LAYUP	0.050	2.986
	*******	*******
BEND FACTOR HOURS		0.0

MATERIAL	USAGE (SQ.IN.)	SCRAP (SQ.IN.)	PERCENT SCRAP
GRAPHITE--3" TAPE	21154.08	6754.08	46.90

	WEIGHT	COST
GRAPHITE--3" TAPE	5.76	115.20

PART CONSOLIDATION

CYCLE NO.: 1
PART NAME: LOWER LONGERON
PART NUMBER: SR001921-19 QTY: 2

COMPONENT DETAIL PARTS

PART NAME	PART NO.	QTY
ANGLE	-77	2
STRAP	-79	1

VACUUM BAGGING: REUSABLE
BAGGING AREA: 360.00 SEALING/CLAMPING PERIMETER: 252.00

CURING TOOL: OVEN

PART CONSOLIDATION

FACTORY STANDARD HOURS	SET-UP	RUN
SET UP	0.050	
BEFORE CURE		
PREFIT DETAILS		0.220
ASSEMBLE DETAILS		0.061
APPLY NONPUROUS FILM		0.006
APPLY VENT CLOTH		0.014
INSTALL THERMOCPLS		0.032
APPLY REUSABLE BAG		0.011
CLAMP EDGES		0.116
CONNECT VACUUM LINES		0.012
SMOOTH BAG DOWN		0.004
CHECK SEALS		0.026
REMOVE VACUUM LINE		0.006
CHECK CHAMBER INT.		0.060
LOAD LAYUP IN OVEN		0.036
CONNECT VACUUM LINES		0.012
CONNECT T.C. LEADS		0.018
CHECK FOR LEAKS		0.158
CLOSE DOOR		0.038
DURING CURE		
SET RECORDERS		0.007
CYCLE CHECK		0.160
SHUT DOWN		0.002
REMOVE CHARTS		0.002
AFTER CURE		
OPEN DOOR		0.038
RELEASE T.C. LEADS		0.007
RELEASE VAC. LINES		0.006
REMOVE PART FR OVEN		0.036
RELEASE CLAMPS		0.035
REMOVE REUS. BAG		0.006
REMOVE THERMOCOUPLES		0.019
REMOVE PROCESS MATL		0.014
REMOVE LAYUP & ASIDE		0.004
CLEAN TOOL		0.004
TOTAL HOURS	0.050	1.232
	********	********

FINISHING

PART NAME: LOWER LONGERON
PART NUMBER: SRC01921-19
PERIMETER: 252.00

QTY: 2
PART AREA: 540.00

NET TRIM OPERATIONS

CODE	MATERIAL(IN.) AVE. THICK.	TRIM LENGTH	FIXT.	TEMP.
2	0.49	126.00	1	0
5	0.49	126.00	0	0

FINISHING

FACTORY STANDARD HOURS	SET-UP	RUN
NET TRIM OPERATIONS		
MACHINE ROUTING	0.200	0.378
HANDLING		0.255
SUBTOTAL		0.633
HAND SANDING	0.020	0.126
HANDLING		0.020
SUBTOTAL		0.146
HOLE OPERATIONS		
TOTAL HOURS	0.220	0.779
	********	********

TOTAL FACTORY LABOR STANDARD HOURS.

FACTORY STANDARD HOURS	SET-UP	RUN
LAYUP	0.100	9.577
HONEYCOMB CORE PREP	0.0	0.0
PART CONSOLIDATION	0.050	1.232
FINISHING OPERATIONS	0.220	0.779
TOTAL HOURS	0.370	11.588
	********	********

COST PROJECTION

PRODUCTION COST ESTIMATE AT UNIT NO.: 1000
AVERAGE LOT SIZE: 10.
LINEAR UNIT CURVE

PROJECTION FACTORS	T1.VAR	CURVE SLOPE
LAYUP	13.35	79.40 %
HONEYCOMB CURE PREP	7.62	85.60 %
PART CONSOLIDATION	11.63	80.20 %
FINISHING OPERATIONS	21.93	76.20 %

LABOR RATES	$/HR
FACTORY LABOR	10.00
QUALITY CONTROL	12.50
TOOLING	14.00
MFG ENGINEERING	15.00
ENGINEERING	11.75
GRAPHIC SERVICES	9.00

SUPPORT FUNCTIONS	BASE		FACTORS
QUALITY CONTROL	1	1	0.20
TOOLING	1	1	0.12
MFG ENGINEERING	1	1	0.14
ENGINEERING	1	1	0.10
GRAPHIC SERVICES	1	1	0.05
SUPPORT MATERIAL	7	2	0.25

OVERHEAD RATES	
FACTORY LABOR	1.900
QUALITY CONTROL	1.200
TOOLING	1.500
MFG ENGINEERING	1.100
ENGINEERING	1.750
GRAPHIC SERVICES	1.100
MATERIAL	0.200
ADMINISTRATIVE	0.250

COST PROJECTION

UNIT COST ESTIMATE AT T 1000

COST ELEMENT	STD. HRS	T 1000 HRS	DOLLARS
FACTORY LABOR			
LAYUP	9.59	12.65	128.47
HONEYCOMB CORE PREP	0.0	0.0	0.0
PART CONSOLIDATION	1.24	1.60	22.34
FINISHING OPERATIONS	0.80	1.17	17.56
TOTAL FACTORY LABOR	11.63	15.61	183.46
SUPPORT LABORS			
QUALITY CONTROL		3.12	39.03
TOOLING		1.87	26.23
MFG ENGINEERING		2.19	32.79
ENGINEERING		1.56	18.35
GRAPHIC SERVICES		0.78	7.03
TOTAL SUPPORT LABOR			123.42
LABOR OVERHEAD			
FACTORY LABOR			348.57
QUALITY CONTROL			46.84
TOOLING			39.35
MFG ENGINEERING			36.07
ENGINEERING			32.11
GRAPHIC SERVICES			7.73
TOTAL OVERHEAD			510.66
TOTAL LABOR			817.54
MATERIAL			
PRODUCTION MATERIAL			345.60
SUPPORT MATERIAL			66.40
MFG. ALLOWANCE			165.77
OVERHEAD			119.55
TOTAL MATERIAL			717.32
ADMINISTRATIVE OVERHEAD			383.72
TOTAL COST			1918.58
			**********

	WEIGHT
LAYUP	17.28
HONEYCOMB CORE PREP	0.0
TOTAL	17.28

COST PROJECTION

CUMULATIVE AVERAGE COST ESTIMATE AT T 1000

COST ELEMENT	STD. HRS	T 1000 HRS	DOLLARS
FACTORY LABOR			
LAYUP	9.59	19.14	191.36
HONEYCOMB CORE PREP	0.0	0.0	0.0
PART CONSOLIDATION	1.24	2.33	32.60
FINISHING OPERATIONS	0.80	1.91	28.60
TOTAL FACTORY LABOR	11.63	23.37	274.61
SUPPORT LABORS			
QUALITY CONTROL		4.67	58.43
TOOLING		2.80	39.26
MFG ENGINEERING		3.27	49.08
ENGINEERING		2.34	27.46
GRAPHIC SERVICES		1.17	10.52
TOTAL SUPPORT LABOR			184.75
LABOR OVERHEAD			
FACTORY LABOR			521.75
QUALITY CONTROL			70.11
TOOLING			58.89
MFG ENGINEERING			53.99
ENGINEERING			48.06
GRAPHIC SERVICES			11.57
TOTAL OVERHEAD			764.37
TOTAL LABOR			1223.72
MATERIAL			
PRODUCTION MATERIAL			345.60
SUPPORT MATERIAL			86.40
MFG. ALLOWANCE			167.59
OVERHEAD			119.92
TOTAL MATERIAL			719.51
ADMINISTRATIVE OVERHEAD			485.81
TOTAL COST			2429.03
			**********

	WEIGHT
LAYUP	17.28
HONEYCOMB CORE PREP	0.0
TOTAL	17.28

COST PROJECTION

CUMULATIVE COST ESTIMATE AT T 1000

COST ELEMENT	STD. HRS	T 1000 HRS	DOLLARS
FACTORY LABOR			
LAYUP	9.59	19135.95	191359.44
HONEYCOMB CORE PREP	0.0	0.0	0.0
PART CONSOLIDATION	1.24	2326.38	32597.27
FINISHING OPERATIONS	0.80	1906.44	28598.56
TOTAL FACTORY LABOR	11.63	23370.76	274606.37
SUPPORT LABORS			
QUALITY CONTROL		4674.15	58426.86
TOOLING		2804.49	39262.87
MFG ENGINEERING		3271.91	49078.58
ENGINEERING		2337.08	27460.64
GRAPHIC SERVICES		1168.54	10516.84
TOTAL SUPPORT LABOR			184745.69
LABOR OVERHEAD			
FACTORY LABOR			521752.00
QUALITY CONTROL			70112.19
TOOLING			58894.30
MFG ENGINEERING			53986.46
ENGINEERING			48056.12
GRAPHIC SERVICES			11568.53
TOTAL OVERHEAD			764369.50
TOTAL LABOR			1223721.00
MATERIAL			
PRODUCTION MATERIAL			345599.81
SUPPORT MATERIAL			86399.94
MFG. ALLOWANCE			5654.22
OVERHEAD			87530.75
TOTAL MATERIAL			525184.69
ADMINISTRATIVE OVERHEAD			437226.25
TOTAL COST			2186131.00 **********

	WEIGHT
LAYUP	17279.98
HONEYCOMB CORE PREP	0.0
TOTAL	17279.98

LOWER FUSELAGE PANEL (SR-001921-15)

DESCRIPTION

The lower fuselage panel is a relatively simple structure composed of three ply (0°_{GR} / 90°_{GR} / $\underline{+45^\circ}_{GL}$ $_T$) graphite-fiberglass/epoxy hybrid skins with localized fiberglass/epoxy buildup areas along the edges of the panel with a honeycomb core substructure. The tooling selected for the fabrication of this structure consists of a "brake formed" steel curing surface mechanically attached to a fiberglass/epoxy honeycomb sandwich base. This concept allowed one to obtain excellent heat-up and cool down rates while maintaining the weight and cost of the tool at a cost competitive base as compared to total metal or plastic tooling.

The hybrid skin assemblies for the lower fuselage panel were layed-up in the flat, with the outer skin being draped into the release coated (Fre-Kote 33) "female" tool. The fiberglass/epoxy localized buildups were then located and resin tacked in place. The localized fiberglass buildups were then located on the honeycomb core assembly and the inner skin assembly was draped and formed to the honeycomb core. No structural adhesive was required between the skin assemblies and honeycomb core as resin bonding was accomplished in these areas through the fiberglass/epoxy adhesive prepreg of the hybrid composite. The assembly was then vacuum bagged using a reusable rubber vacuum bag and cocured in one operation in an oven at vacuum pressure (15 psi) for two hours at 300°F with no resin bleeding being accomplished. After the cocuring cycle the lower panel exhibited an excellent aerodynamic surface on the outer mold-line skin, with the total assembly displaying good dimensional tolerances and configuration stability. The panel was then net trimmed and subjected to

quality assurance evaluations with no out-of-pattern readings being recorded. The panel was then set aside for subsequent joining to the lower longerons and equipment deck.

MANUFACTURING PLAN

1. The following list of detail parts makes up the lower panel assembly.
   a. Composite skin - upper (-69)
   b. Composite skin - lower (-67)
   c. Honeycomb core - 3.1 lbs/ft^3 (-65)

2. Materials
   a. Thornel 300/SP288 graphite/epoxy - per NAI-1332
   b. Narmco 3203 fiberglass/epoxy
   c. Aluminum honeycomb core - per NAI-1171, Class I

3. Machining of (-65) Honeycomb Core
   a. The honeycomb core shall conform to NAI-1171. Use 0.0007 foil, 0.125-inch cell, 3.1 lbs/ft^3 density, 5056-H39 aluminum alloy (CR III coated) per specification QQ-A-250/8.
   b. Machine honeycomb core per drawing SR-001921 (-15). Note ribbon direction.
   c. Roll form core to shape of lower panel cocuring tool.

4. Layup and Cocure of Graphite-Fiberglass/Epoxy Hybrid Skin Assemblies
   a. The No. 1 composite ply (0° - graphite) of the lower skin (-67) shall be draped and formed to the lower panel cocuring tool.

b. The No. 2 composite ply (90° - graphite) of the lower skin shall be draped and formed over the No. 1 composite ply (ply-on-ply).

c. The No. 3 composite ply (+45° fiberglass) of the lower skin shall be draped and formed over the No. 2 composite ply (ply-on-ply).

d. The -6 honeycomb core which has been previously machined and roll formed shall be positioned on the lower skin. No structural adhesive is required between the honeycomb core and lower skin assembly as resin bonding is accomplished through the fiberglass/epoxy adhesive prepreg ply during the cocuring cycle.

e. The No. 1 composite ply (+45° fiberglass) of the upper skin shall be draped and formed over the -65 honeycomb core. No structural adhesive is required between the honeycomb core and No. 1 composite ply of the upper skin as resin bonding is accomplished through the fiberglass/epoxy adhesive prepreg during the cocuring operation.

f. The No. 2 composite ply (90° - graphite) of the upper skin shall be draped and formed over the No. 1 composite ply (ply-on-ply).

g. The No. 3 composite (0° - graphite) of the upper skin shall be draped and formed over the No. 2 composite ply (ply-on-ply).

h. Apply a layer of non-porous armalon over the entire assembly. Do not resin bleed composite skins.

i. Position fairing blocks around periphery of assembly to prevent core crushing during cocuring operation.

j. Position rubber tooling aids in core transition areas of assembly to prevent core migration.

k. Apply two layers of Osnaburg breather cloth over the entire assembly.

1. The component shall be vacuum bagged using the reusable rubber vacuum bag, and cocured at vacuum bag pressure (15 psi) only, in an oven with a cure temperature of two hours at 300°F as monitored by thermocouples.

ACCEM-0 INPUT CHECKLIST

CARD 1

ESTIMATOR NAME	1	TIMOTHY J. BETTNER
ESTIMATE NUMBER	21	970
PART NAME	41	LOWER FUSELAGE PANEL
PART NUMBER	61	SR-001921(-15)

CARD 2 INPUT FORMS

		QUANTITY USED	
ACCEM-1	LAYUP	1	0.2
ACCEM-2	HONEYCOMB CORE PREPARATION	3	0.1
ACCEM-3	PART CONSOLIDATION	5	0.1
ACCEM-4	FINISHING OPERATIONS	7	0.1
ACCEM-5	COST PROJECTION	9	0.1

ACCEM-1 LAYUP

CARD 1 PART NAME (1) UPPER SKIN PART NUMBER (21) 60 QTY (41) 001

TRIM ALLOWANCE (51) 1 IN.

LAYUP TOOL SAME AS CURING TOOL (CIRCLE ONE) YES (61) 1 NO 0

DEBULKING NUMBER OF OCCURRENCES (62)

TYPE OF BAG (CIRCLE ONE) DISPOSABLE (63) 1 REUSABLE 2

CARD 2 (BLANK)

CARD 3

	GRAPHITE		FIBERGLASS	
	TAPE	WOVEN	TAPE	WOVEN
COST ($/LB)	(1) 98	(11)	(21)	(31) 20
DENSITY (LB/SQ.IN.)	(41)	(51)	(61)	(71)

KEYPUNCH CARD 4 AND CARD 5 ALTERNATELY

CARD 4

METHOD	SEND DESCRIPTION					
	QUANTITY OF PREPLIES	DEPOSITION TECHNIQUE	TYPE OF BEND	BEND LENGTH (IN.)	RADIUS OF CURVATURE	FLANGE WIDTH (IN.)
				(11)	(21)	(31)
2	1	1	4	25	16	
			1	50		
			2	50		
2	1	1	4	25	16	
			1	50		
			2	50		
2	1	1	4	25	16	
			1	50		
			2	50		
9999						

CARD 5

PLY DESCRIPTION								
		DIMENSIONS						MATERIAL
		RECTANGULAR		NONRECTANGULAR				
ORIENTATION (DEG.)	COUNT	LENGTH (IN.)	WIDTH (IN.)	AREA (SQ.IN.)	DISTANCE (IN.)			FORM
(1)	(11)	(21)	(31)	(41)	(51)			(71)
045	001	35	25					1
000	001	35	25					1
090	001	35	25					1
000								

LAST ENTRY ON CARD 4 IS "9999"; LAST ENTRY ON CARD 5 IS "000"

LEGEND

HANDLING METHOD:	1 = PREPLY, 2 = DIRECT-ON-TOOL
LAYUP METHOD:	1 = MANUAL, 2 = HAND-ASSIST, 4 = CONRAC AUTOMATIC (720 IPM), 5 = CONRAC AUTOMATIC (360 IPM)
DEPOSITION TECHNIQUE:	1 = PLY-ON-PLY, 2 = PLY-ON-MYLAR
TYPE OF BEND:	1 = STRAIGHT, SHARP, MALE; 2 = STRAIGHT, SHARP, FEMALE; 3 = STRAIGHT, RADIAL ALE; 4 = STRAIGHT, RADIAL, FEMALE; 5 = CURVED, SHRINK FLANGE (TAPE); 6 = CURVED, STRAIGHT FLANGE (TAPE); 7 = CURVED (WOVEN MATERIAL)
MATERIAL FORM:	1 = UNIDIRECTIONAL TAPE, 2 = WOVEN
MATERIAL TYPE:	1 = GRAPHITE/EPOXY, 2 = FIBERGLASS/EPOXY

ACCEM-1 LAYUP

CARD 1

PART NAME: LOWER SKIN (1) — PART NUMBER: 67 (21) — QTY: 001 (41)

TRIM ALLOWANCE: 1.0 IN. (51)

LAYUP TOOL SAME AS CURING TOOL (CIRCLE ONE): YES (61) — NO 0 (61)

DEBULKING — NUMBER OF OCCURRENCES: (62)

TYPE OF BAG (CIRCLE ONE): DISPOSABLE 1 (63) — REUSABLE 2 (63)

CARD 2 (BLANK)

CARD 3

	GRAPHITE		FIBERGLASS	
	TAPE	WOVEN	TAPE	WOVEN
COST ($/LB) (1)	85			20 (31)
DENSITY (LB/SQ.IN.) (41)				

KEYPUNCH CARD 4 AND CARD 5 ALTERNATELY

CARD 4

METHOD	BEND DESCRIPTION			
QUANTITY OF PREPLIES	TYPE OF BEND	BEND LENGTH (IN.)	RADIUS OF CURVATURE	FLANGE WIDTH (IN.)
2	1	25	1	
2	1	25	1	
2	1	25	1	
9999				

CARD 5

PLY DESCRIPTION							
ORIENTATION (DEG.)	COUNT	DIMENSIONS				MATERIAL	
		RECTANGULAR		NONRECTANGULAR			
		LENGTH (IN.)	WIDTH (IN.)	AREA (SQ.IN.)	DISTANCE (IN.)	FORM	WIDTH
000	001	33	25			1	3
000	001	33	25			1	3
045	001	33	25			1	3
000							

LAST ENTRY ON CARD 4 IS "9999"; LAST ENTRY ON CARD 5 IS "000"

LEGEND

HANDLING METHOD: 1 = PREPLY, 2 = DIRECT-ON-TOOL

LAYUP METHOD: 1 = MANUAL, 2 = HAND-ASSIST, 4 = CONRAC AUTOMATIC (720 IPM), 5 = CONRAC AUTOMATIC (360 IPM)

DEPOSITION TECHNIQUE: 1 = PLY-ON-PLY, 2 = PLY-ON-MYLAR

TYPE OF BEND: 1 = STRAIGHT, SHARP, MALE; 2 = STRAIGHT, SHARP, FEMALE; 3 = STRAIGHT, RADIAL MALE; 4 = STRAIGHT, RADIAL, FEMALE; 5 = CURVED, SHRINK FLANGE (TAPE); 6 = CURVED, STRAIGHT FLANGE (TAPE); 7 = CURVED (WOVEN MATERIAL)

MATERIAL FORM: 1 = UNIDIRECTIONAL TAPE, 2 = WOVEN

MATERIAL TYPE: 1 = GRAPHITE/EPOXY, 2 = FIBERGLASS/EPOXY

ACCEM-2 HONEYCOMB CORE PREPARATION

CARD 1

PART NAME	PART NUMBER	QTY.
HONEYCOMB CORE	65	0.01

CARD 2 MATERIAL DESCRIPTION

CELL SIZE:	.125	IN.
DENSITY:	3	LB./CU. FT.
THICKNESS:	.65	IN.
AREA:	750	SQ. IN.
COST:	3.504	$/PART

OPERATIONS

CARD 3

SAWING — LENGTH OF CUT:		IN.
MACHINING		
FLAT — LENGTH OF CUT:		IN.
MAXIMUM WIDTH:		IN.
CONTOUR — LENGTH OF CUT:		IN.
MAXIMUM WIDTH:		IN.
STEP — LENGTH OF CUT:		IN.
WIDTH OF CUT:		IN.
SCARF — LENGTH OF CUT:	5.0	IN.
WIDTH OF CUT:	.1	IN.

CARD 4

BLEND CUTOUTS — LENGTH OF CUT:		IN.
QUANTITY:		
HANDFORMING (CIRCLE ONE) — YES: (1) NO: 0		
BRAKEFORMING (CIRCLE ONE) — RADIUS OF CURVATURE:		IN.
DIE LENGTH ≤6 FT: (1) >6 (2)		
NO. DIE CHANGES:		
NO. DIE REPOSITIONS:		
LIQUID POTTING — VOLUME FILLED:		CU. IN.
TAPE FOAMING — VOLUME FILLED:		CU. IN.

ACCEM-3 PART CONSOLIDATION

CYCLE NUMBER 1

CARD 1

PART NAME (1)	PART NUMBER (21)	QUANTITY (61)
LOWER FUSELAGE PANEL	SR-00192(-13)	0.01

COMPONENT DETAIL PARTS

NUMBER OF LINES USED (61) 03 (MAXIMUM 10)

CARD 2

PART NAME (1)	PART NUMBER (21)	QUANTITY (61)
LOWER SKIN	66	0.01
UPPER SKIN	67	0.01
HONEYCOMB CORE	65	0.01

CARD 3

CONSOLIDATION OF DETAILS

ADHESIVE (CIRCLE ONE) (1) NO: (2) 0 YES: (1) 1

APPLICATION AREA: _____ SQ. IN.

ADDITIONAL OPERATIONS (CIRCLE IF APPLICABLE) (11) BONDING: 1 (11) SPLICING: 2

CURING PROCESS

VACUUM BAGGING

TYPE OF BAG: (CIRCLE ONE) (12) DISPOSABLE: 1 (12) REUSABLE: 2

RESIN BLEED: (CIRCLE ONE) (13) NO: 0 (13) YES: 1

PLY-TO-BLEEDER RATIO: (14) _____ -TO-1

BAGGING AREA: (21) 8.25 SQ. IN.

SEALING/CLAMPING PERIMETER: (31) 1.16 IN.

THERMAL EXPANSION MOLDING

EXTERNAL MOLD CAGE DIMENSIONS:

LENGTH: (41) _____ IN.

WIDTH: (51) _____ IN.

DEPTH: (61) _____ IN.

CURING TOOL: (CIRCLE ONE) (71)

AUTOCLAVE: 1

OVEN: 2

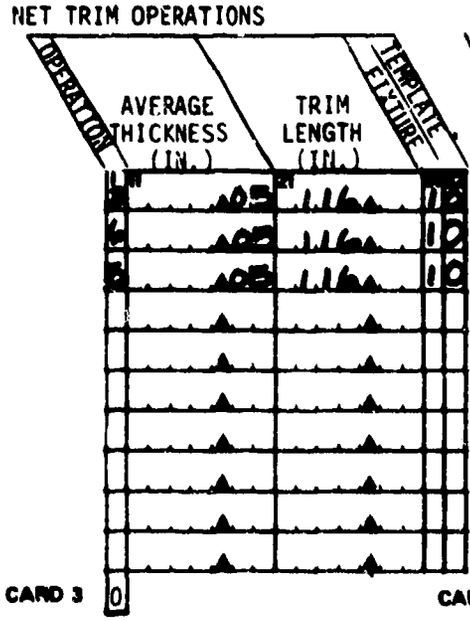
HEATING ELEMENT: 3

ACCEM-4 FINISHING OPERATIONS

CARD 1 | PART NAME: LOWER FUSELAGE PANEL | PART NUMBER: 32-00192(-15) | QTY: 001

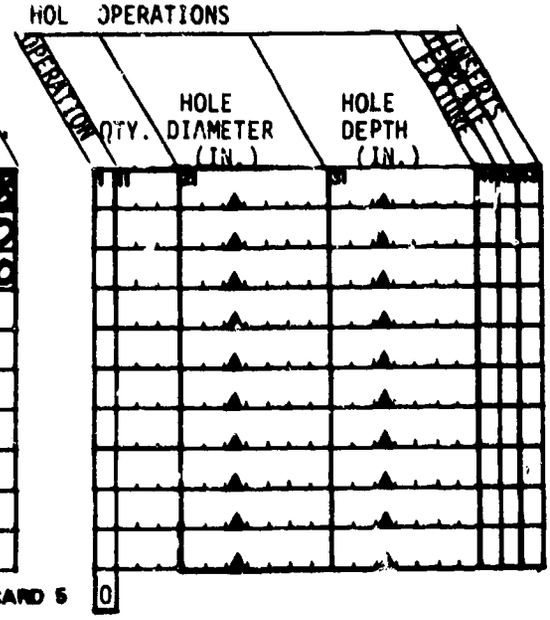
PART AREA: 825. SQ. IN.

CARD 2 (OMIT IF LEFT BLANK)
NET TRIM OPERATIONS



CARD 3 | 0

CARD 4 (OMIT IF LEFT BLANK)
HOL OPERATIONS



CARD 5 | 0

LEGEND

OPERATION:
1 = HAND ROUTING
2 = MACHINE ROUTING
3 = HAND SAWING
4 = MACHINE SAWING
5 = HAND SANDING
6 = PORTABLE TOOL SANDING
7 = MACHINE SANDING

FIXTURE:
0 = NO,
1 = YES

TEMPLATE:
0 = NO
1 = YES

LEGEND

OPERATION:
1 = DRILLING
2 = COUNTERBORING
3 = REAMING
4 = COUNTERSINKING
5 = HOLE SAWING
6 = HOLE PUNCHING

FIXTURE:
0 = NO
1 = EXTERNAL
2 = INTERNAL

TEMPLATE:
0 = NO
1 = YES

INSERTS:
0 = NO
1 = YES

ACCEM-5 COST PROJECTION

CARD 1

UNIT NUMBER 10,000
AVE. LOT SIZE 100

TYPE OF ESTIMATE

UNIT COST	COL. 21 NO 0	YES (1)	(CIRCLE ONE)
CUMULATIVE AVERAGE COST	COL. 22 NO 0	YES (2)	(CIRCLE ONE)
CUMULATIVE TOTAL COST	COL 23 NO 0	YES (3)	(CIRCLE ONE)

CARD 2

FACTORY LABOR PROJECTION FACTORS

LEARNING CURVE: LOG-LINEAR UNIT (0) CUM. AVE. (1) (CIRCLE ONE) — COL. 24

DATA INPUT OPTIONS (CIRCLE ONE) — COL. 1

NONE (0)
ITEM (a) - (d) (1)
ITEM (e) (2)

(a) LAYUP
(b) CORE PREPARATION
(c) PART CONSOLIDATION
(d) FINISHING OPERATIONS

TOTAL FACTORY LABOR

CARD 3 — T_1 VARIANCE

CARD 4 — LEARNING CURVE SLOPE

DATA INPUT OPTIONS (CIRCLE ONE) — COL. 2

NONE (0)
ITEMS (a) - (f) (1)

LABOR RATES

(a) FACTORY LABOR
(b) QUALITY CONTROL
(c) TOOLING
(d) MFG. ENG.
(e) ENGINEERING
(f) GRAPHIC SERVICES

CARD 5 — $/HR

DATA INPUT OPTIONS (CIRCLE ONE) — COL. 3

NONE (0)
CARDS (6) - (8) (1)
CARD (9) (2)

SUPPORT FUNCTIONS

	CARD 6 BASE	CARD 7 BASE UNIT
QUALITY CONTROL	2	2
TOOLING	3	3
MFG. ENG.	4	4
ENGINEERING	5	5
GRAPHIC SERVICES	6	6
SUPPORT MATERIAL		

CARD 8 — FACTOR

CARD 9 — LABOR HRS/MAT'L $'S

LEGEND

BASE: 1 = FACTORY FABRICATION, 2 = QUALITY CONTROL, 3 = TOOLING, 4 = MFG. ENG. 5 = ENGINEERING, 6 = GRAPHIC SERVICES, 7 = PRODUCTION MAT'L

BASE UNIT: 1 = HOURS, 2 = DOLLARS

DATA INPUT OPTIONS (CIRCLE ONE) — COL. 4

NONE (0)
ITEMS (a) - (f), (2), (3) (1)
ITEMS (1), (2), (3) (2)

OVERHEAD RATES

(a) FACTORY FABRICATION
(b) QUALITY CONTROL
(c) TOOLING
(d) MFG. ENG.
(e) ENGINEERING
(f) GRAPHIC SERVICES
  (1) TOTAL LABOR
  (2) MATERIAL
  (3) ADMINISTRATIVE

CARD 10

CARD 11

ADVANCED COMPOSITE COST ESTIMATE

ESTIMATOR: TIMOTHY J. BETTNER DATE: 09/23/76

ESTIMATE NUMBER: 970

PART NAME: LOWER FUSELAGE PANEL

PART NUMBER: SR-0019211-151

INPUT FORMS	QUANTITY
LAYUP	2
HONEYCOMB CORE OPERATION	1
PART CONSOLIDATION	1
FINISHING OPERATIONS	1
COST PROJECTIONS	1

LAYUP

PART NAME: UPPER SKIN
PART NUMBER: 69
LAYUP TOOL = CURING TOOL

QTY: 1
TRIM ALLOWANCE: 1.00

MATERIAL DATA

	DENSITY	COST
GRAPHITE--3" TAPE	0.000400	93.00
GRAPHITE--12" TAPE	0.000400	93.00
GRAPHITE--WOVEN	0.000880	93.00
FIBERGLASS--3" TAPE	0.000540	6.70
FIBERGLASS--12" TAPE	0.000540	6.70
FIBERGLASS--WOVEN	0.001040	20.00

PLY DESCRIPTION

					BEND DATA					RECT		NON-RECT		MATL		
LD	#P	LH	LT	TB	LENGTH	CR	FW	ORI	CT	LENGTH	WIDTH	AREA	DIST	F	T	WD
2	0	1	1	4	25.00	16.00	0.0	45	1	33.00	25.00	0.0	0.0	2	2	36.
0	0	0	0	1	50.00	0.0	0.0	0	0	0.0	0.0	0.0	0.0	0	0	0.
0	0	0	0	2	50.00	0.0	0.0	0	0	0.0	0.0	0.0	0.0	0	0	0.
2	0	1	1	4	25.00	16.00	0.0	0	1	33.00	25.00	0.0	0.0	1	1	3.
0	0	0	0	1	50.00	0.0	0.0	0	0	0.0	0.0	0.0	0.0	0	0	0.
0	0	0	0	2	50.00	0.0	0.0	0	0	0.0	0.0	0.0	0.0	0	0	0.
2	0	1	1	4	25.00	16.00	0.0	90	1	33.00	25.00	0.0	0.0	1	1	3.
0	0	0	0	1	50.00	0.0	0.0	0	0	0.0	0.0	0.0	0.0	0	0	0.
0	0	0	0	2	50.00	0.0	0.0	0	0	0.0	0.0	0.0	0.0	0	0	0.

	LAYUP	
FACTORY STANDARD HOURS	SET-UP	RUN
CLEAN LAYUP TOOL	0.0	0.010
APPLY RELEASE AGENT	0.0	0.015
PLY DEPOSITION	0.100	0.346
SUBTOTAL	0.100	0.371
TOTAL LAYUP	0.100	0.371
	********	********
BEND FACTOR HOURS		0.035

MATERIAL	USAGE (SQ.IN.)	SCRAP (SQ.IN.)	PERCENT SCRAP
GRAPHITE—3" TAPE	1917.00	267.00	16.18
FIBERGLASS—WOVEN	1660.81	655.81	103.73

	WEIGHT	COST
GRAPHITE—3" TAPE	0.66	61.28
FIBERGLASS—WOVEN	0.86	17.16

LAYUP

PART NAME: LOWER SKIN
PART NUMBER: 67
LAYUP TOOL = CURING TOOL

QTY: 1
TRIM ALLOWANCE: 1.00

MATERIAL DATA

	DENSITY	COST
GRAPHITE--3" TAPE	0.000400	93.00
GRAPHITE--12" TAPE	0.000400	93.00
GRAPHITE--WOVEN	0.000880	93.00
FIBERGLASS--3" TAPE	0.000540	8.70
FIBERGLASS--12" TAPE	0.000540	8.70
FIBERGLASS--WOVEN	0.001040	20.00

BEND DATA

LD	#P	LH	DT	TB	LENGTH	CR	FW
2	0	1	1	4	25.00	16.00	0.0
2	0	1	1	4	25.00	16.00	0.0
2	0	1	1	4	25.00	16.00	0.0

PLY DESCRIPTION

		RECT		NON-RECT		MATL		
ORI	CT	LENGTH	WIDTH	AREA	DIST	F	T	WD
0	1	33.00	25.00	0.0	0.0	1	1	3.
90	1	33.00	25.00	0.0	0.0	1	1	3.
45	1	33.00	25.00	0.0	0.0	1	1	3.

FACTORY STANDARD HOURS	LAYUP SET-UP	LAYUP RUN
CLEAN LAYUP TOOL	0.0	0.006
APPLY RELEASE AGENT	0.0	0.009
PLY DEPOSITION	0.050	0.365
SUBTOTAL	0.050	0.380
TOTAL LAYUP	0.050	0.380
	********	********
BEND FACTOR HOURS		0.001

MATERIAL	USAGE (SQ.IN.)	SCRAP (SQ.IN.)	PERCENT SCRAP
GRAPHITE--3" TAPE	2912.22	437.22	17.67

	WEIGHT	COST
GRAPHITE--3" TAPE	0.99	92.07

ALUMINUM HONEYCOME CORE PREPARATION

PART NAME: HONEYCOMB CORE
PART NUMBER: 65

QTY: 1
COST/SQ.FT.: 35.04

CORE CELL SIZE: 0.12500
CORE DEPTH: 0.63

CORE DENSITY: 3.10
CORE AREA: 750.00

SCARF MACHINING—LENGTH(IN.): 50.00 WIDTH(IN.): 1.00
HANDFORMING

FACTORY STANDARL HOURS	SET-UP	RUN
POLYGLYCOL	0.020	0.153
SCARF CUT MACHINING	0.110	0.030
SCARF CUT HANDLING	0.0	0.075
HAND FORMING	0.050	0.024
CORE CLEANING	0.050	0.006
TOTAL HOURS	0.230	0.289
	********	********

	WEIGHT	COST
HONEYCOMB CORE	0.85	182.50

PART CONSOLIDATION

CYCLE NO.: 1
PART NAME: LOWER FUSELAGE PANEL
PART NUMBER: SK-001921(-15) QTY: 1

COMPONENT DETAIL PARTS

PART NAME	PART NO.	QTY
LOWER SKIN	69	1
UPPER SKIN	67	1
HONEYCOMB CORE	65	1

VACUUM BAGGING: REUSABLE
BAGGING AREA: 825.00 SEALING/CLAMPING PERIMETER: 116.00

CURING TOOL: OVEN

PART CONSOLIDATION

FACTORY STANDARD HOURS	SET-UP	RUN
SET UP	0.050	
BEFORE CURE		
PREFIT DETAILS		0.158
ASSEMBLE DETAILS		0.048
APPLY NONPOROUS FILM		0.007
APPLY VENT CLOTH		0.017
INSTALL THERMOCPLS		0.032
APPLY REUSABLE BAG		0.012
CLAMP EDGES		0.027
CONNECT VACUUM LINES		0.006
SMOOTH BAG DOWN		0.005
CHECK SEALS		0.020
REMOVE VACUUM LINE		0.003
CHECK CHAMBER INT.		0.030
LOAD LAYUP IN OVEN		0.036
CONNECT VACUUM LINES		0.012
CONNECT T.C. LEADS		0.018
CHECK FOR LEAKS		0.054
CLOSE DOOR		0.019
DURING CURE		
SET RECORDERS		0.004
CYCLE CHECK		0.080
SHUT DOWN		0.001
REMOVE CHARTS		0.001
AFTER CURE		
OPEN DOOR		0.019
RELEASE T.C. LEADS		0.007
RELEASE VAC. LINES		0.006
REMOVE PART FR OVEN		0.036
RELEASE CLAMPS		0.008
REMOVE REUS. BAG		0.007
REMOVE THERMOCOUPLES		0.019
REMOVE PROCESS MATL		0.016
REMOVE LAYUP & ASIDE		0.005
CLEAN TOOL		0.005
TOTAL HOURS	0.050	0.719
	********	********

FINISHING

PART NAME: LOWER FUSELAGE PANEL
PART NUMBER: SK-0019211-15)
PERIMETER: 116.00

QTY: 1
PART AREA: 625.00

NET TRIM OPERATIONS

	MATERIAL(IN.)			
CODE	AVE. THICK.	TRIM LENGTH	FIXT.	TEMP.
3	0.05	116.00	1	0
6	0.05	116.00	1	0
5	0.05	116.00	1	0

FINISHING

FACTORY STANDARD HOURS	SET-UP	RUN
NET TRIM OPERATIONS		
HAND SAWING	0.020	0.073
HANDLING		0.092
SUBTOTAL		0.165
HAND SANDING	0.020	0.058
HANDLING		0.092
SUBTOTAL		0.150
PORT. TOOL SANDING	0.020	0.007
HANDLING		0.092
SUBTOTAL		0.099
HOLE OPERATIONS		
TOTAL HOURS	0.060	0.414
	*******	*******

TOTAL FACTORY LABOR STANDARD HOURS

FACTORY STANDARD HOURS	SET-UP	RUN
LAYUP	0.150	0.791
HONEYCOMB CORE PREP	0.230	0.289
PART CONSOLIDATION	0.050	0.719
FINISHING OPERATIONS	0.060	0.414
TOTAL HOURS	0.490	2.173
	********	********

COST PROJECTION

PRODUCTION COST ESTIMATE AT UNIT NO.: 1000
AVERAGE LOT SIZE: 10.
LINEAR UNIT CURVE

PROJECTION FACTORS	T1.VAR	CURVE SLOPE
LAYUP	23.24	76.63 %
HONEYCOMB CORE PREP	16.83	0.0 %
PART CONSOLIDATION	25.06	76.52 %
FINISHING OPERATIONS	23.84	76.77 %

LABOR RATES	$/HR
FACTORY LABOR	10.00
QUALITY CONTROL	10.00
TOOLING	10.00
MFG ENGINEERING	10.00
ENGINEERING	10.00
GRAPHIC SERVICES	10.00

SUPPORT FUNCTIONS	BASE		FACTORS
QUALITY CONTROL	1	1	1.41
TOOLING	1	1	4.22
MFG ENGINEERING	1	1	2.55
ENGINEERING	1	1	1.64
GRAPHIC SERVICES	1	1	0.40
SUPPORT MATERIAL	7	2	0.30

OVERHEAD RATES	
FACTORY LABOR	1.500
QUALITY CONTROL	1.500
TOOLING	1.500
MFG ENGINEERING	1.500
ENGINEERING	1.700
GRAPHIC SERVICES	1.700
MATERIAL	0.200
ADMINISTRATIVE	0.150

COST PROJECTION

UNIT COST ESTIMATE AT T 1000

COST ELEMENT	STD. HRS	T 1000 HRS	DOLLARS
FACTORY LABOR			
LAYUP	0.77	1.26	12.55
HONEYCOMB CORE PREP	0.31	0.44	4.40
PART CONSOLIDATION	0.72	1.26	12.61
FINISHING OPERATIONS	0.42	0.72	7.19
TOTAL FACTORY LABOR	2.22	3.67	36.74
SUPPORT LABORS			
QUALITY CONTROL		0.27	2.68
TOOLING		0.13	1.28
MFG ENGINEERING		0.20	1.95
ENGINEERING		0.10	1.00
GRAPHIC SERVICES		0.04	0.45
TOTAL SUPPORT LABOR			7.36
LABOR OVERHEAD			
FACTORY LABOR			55.12
QUALITY CONTROL			4.03
TOOLING			1.92
MFG ENGINEERING			2.93
ENGINEERING			1.69
GRAPHIC SERVICES			0.76
TOTAL OVERHEAD			66.44
TOTAL LABOR			110.55
MATERIAL			
PRODUCTION MATERIAL			353.11
SUPPORT MATERIAL			105.93
MFG. ALLOWANCE			44.73
OVERHEAD			100.76
TOTAL MATERIAL			604.53
ADMINISTRATIVE OVERHEAD			107.26
TOTAL COST			822.34
			**********

	WEIGHT
LAYUP	2.51
HONEYCOMB CORE PREP	0.85
TOTAL	3.36

COST PROJECTION

CUMULATIVE AVERAGE COST ESTIMATE AT T 1000

COST ELEMENT	STD. HRS	T 1000 HRS	DOLLARS
FACTORY LABOR			
LAYUP	0.77	2.03	20.33
HONEYCOMB CORE PREP	0.31	0.47	4.71
PART CONSOLIDATION	0.72	2.05	20.48
FINISHING OPERATIONS	0.42	1.16	11.60
TOTAL FACTORY LABOR	2.22	5.71	57.13
SUPPORT LABORS			
QUALITY CONTROL		0.65	6.52
TOOLING		0.50	4.98
MFG ENGINEERING		0.77	7.75
ENGINEERING		0.34	3.40
GRAPHIC SERVICES		0.10	0.99
TOTAL SUPPORT LABOR			23.63
LABOR OVERHEAD			
FACTORY LABOR			85.69
QUALITY CONTROL			9.78
TOOLING			7.47
MFG ENGINEERING			11.62
ENGINEERING			5.78
GRAPHIC SERVICES			1.68
TOTAL OVERHEAD			122.02
TOTAL LABOR			202.78
MATERIAL			
PRODUCTION MATERIAL			353.11
SUPPORT MATERIAL			105.93
MFG. ALLOWANCE			45.14
OVERHEAD			100.84
TOTAL MATERIAL			605.02
ADMINISTRATIVE OVERHEAD			121.17
TOTAL COST			928.96

	WEIGHT
LAYUP	2.51
HONEYCOMB CORE PREP	0.85
TOTAL	3.36

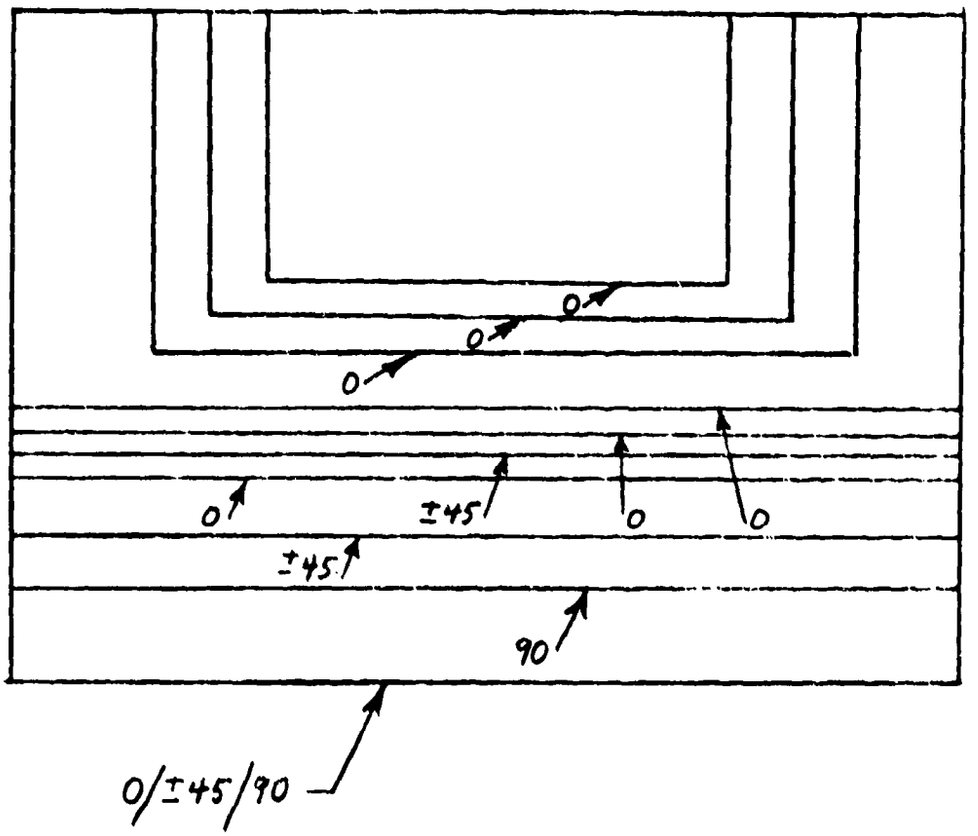
COST PROJECTION

CUMULATIVE COST ESTIMATE AT T 1000

COST ELEMENT	STD. HRS .	T 1000 HRS	DOLLARS
FACTORY LABOR			
LAYUP	0.77	2033.19	20331.87
HONEYCOMB CORE PREP	0.31	471.27	4712.72
PART CONSOLIDATION	0.72	2048.44	20484.93
FINISHING OPERATIONS	0.42	1159.83	11598.29
TOTAL FACTORY LABOR	2.22	5712.78	57127.77
SUPPORT LABORS			
QUALITY CONTROL		651.78	6517.77
TOOLING		498.06	4980.55
MFG ENGINEERING		774.82	7748.24
ENGINEERING		339.91	3399.14
GRAPHIC SERVICES		98.60	986.01
TOTAL SUPPORT LABOR			23631.71
LABOR OVERHEAD			
FACTORY LABOR			85691.62
QUALITY CONTROL			9776.65
TOOLING			7470.83
MFG ENGINEERING			11622.36
ENGINEERING			5778.53
GRAPHIC SERVICES			1676.22
TOTAL OVERHEAD			122016.06
TOTAL LABOR			202775.50
MATERIAL			
PRODUCTION MATERIAL			353109.81
SUPPORT MATERIAL			105932.94
MFG. ALLOWANCE			1186.55
OVERHEAD			92045.81
TOTAL MATERIAL			552275.06
ADMINISTRATIVE OVERHEAD			113257.56
TOTAL COST			868308.12
			**********

	WEIGHT
LAYUP	2508.00
HONEYCOMB CORE PREP	847.66
TOTAL	3355.66

UPPER AND LOWER SKINS - TRAILING EDGE FLAP



MANUFACTURING PLAN

1. The following list of details makes up the skins for the trailing edge flap.

   a. Composite skin - upper

   b. Composite skin - lower

2. Materials

   a. AS/3501 - 5 prepreg 12" wide

3. Layup and Cure of Graphite/Epoxy Skin Assemblies

a. The composite skin is composed of 15 tapered plies. Ply orientation and stacking sequences is established by using mylar tooling aids. After the mylars are stacked the sequence is inspected and checked against the engineering drawings.

b. Mylars are then covered with 3501 prepreg to the proper orientation and again stacked prior to final layup.

c. The mylars are keyed to two tooling holes along the main spar element line. The tool is prepared by first applying a coat of release agent (Fre-Kote 33) and covered with 1 mill thick Teflon separator film.

d. After the tool is prepared the first ply is orientated to the two tooling holes, smoothed down, and the mylar removed. This procedure is then repeated until all 15 plies have been placed on the tool.

e. An excess of approximately one inch is left on the preplying for resin content, fiber volume and void content determinations.

f. The layup is then covered perforated release film, 120 fiberglass bleeder cloth applied in a ratio of 1:3, and the layup closed out with a non-perforated release film and a disposable nylon vacuum bag. Leak tests are then performed to insure proper bag closeout.

g. The skins are autoclaved cured using the following cure cycle listed below:
   1. Apply full vacuum
   2. Heat at 225 F; add 85 psi pressure
   3. Continue heating to 350 F
   4. Cure at 350 F for 30 minutes
   5. Cool below 150 F before releasing pressure.

h. Upon removal of the component from the bag, it will be exposed and checked for conformity to previously determined dimensions and aerodynamic smoothness requirements; and discrepancy will be recorded.

i. The component was net trimmed to final dimensions and fiber volume, resin content, voids and density determinations made.

ACCEM-0 INPUT CHECKLIST

CARD 1

ESTIMATOR NAME	1	J.A. LORENZANA
ESTIMATE NUMBER	21	NAD-3901-5
PART NAME	41	T.E. FLAP SKINS
PART NUMBER	61	330-15

CARD 2

INPUT FORMS		QUANTITY USED	
ACCEM-1	LAYUP	1	0.1
ACCEM-2	HONEYCOMB CORE PREPARATION	3	0.0
ACCEM-3	PART CONSOLIDATION	5	0.1
ACCEM-4	FINISHING OPERATIONS	7	0.1
ACCEM-5	COST PROJECTION	9	0.2

ACCIM-1 LAYUP

CARD 1 PART NAME: TE FLAP SKINS (1) PART NUMBER: 350-15 (21) QTY: 002 (41)

TRIM ALLOWANCE: (51) IN

LAYUP TOOL SAME AS CURING TOOL (CIRCLE ONE): YES (61) NO 0

DEBULKING: NUMBER OF OCCURRENCES (62) (64)

TYPE OF BAG (CIRCLE ONE): DISPOSABLE 1 REUSABLE 2 (64)

CARD 2 (BLANK)

CARD 3

	GRAPHITE			FIBERGLASS		
	TAPE	WOVEN		TAPE	WOVEN	
COST ($/LB)	(11)	(21)		(31)	(41)	
DENSITY (LB/SQ FT)	(12)	(22)		(32)	(42)	

KEYPUNCH CARD 4 AND CARD 5 ALTERNATELY

CARD 4

METHOD	BEND DESCRIPTION				
	QUANTITY OF PREPLIES	TYPE OF BEND	BEND LENGTH (IN.)	RADIUS OF CURVATURE	FLANGE WIDTH (IN.)
(1)	(2)	(3)	(11)	(21)	(31)

CARD 5

PLY DESCRIPTION								
	ORIENTATION (DEG.)	COURT	DIMENSIONS				MATERIAL	
			RECTANGULAR		NONRECTANGULAR			
			LENGTH (IN.)	WIDTH (IN.)	AREA (SQ.IN.)	DISTANCE (IN.)	TYPE	WIDTH
(1)	(2)	(3)	(21)	(31)	(41)	(51)	(1)	(2)

9999																				
	000	001	48.	22.																
	090	001	48.	43.																
	000	001	48.	49.																
	000	001	48.	28.																
	000	001	32.5	22.5																
	045	002	48.	38.																
	000	001	40.5	25.																
	000	001	48.	35.																
	000	001	48.	49.																
	090	001	48.	50.																
	045	002	48.	29.																
9999																				

LAST ENTRY ON CARD 4 IS "9999"; LAST ENTRY ON CARD 5 IS "000"

LEGEND:

HANDLING METHOD: 1 = PREPLY, 2 = DIRECT-ON-TOOL

LAYUP METHOD: 1 = MANUAL, 2 = HAND-ASSIST, 4 = CONRAC AUTOMATIC (720 IPM), 5 = CONRAC AUTOMATIC (360 IPM)

DEPOSITION TECHNIQUE: 1 = PLY-ON-PLY, 2 = PLY ON MYLAR

TYPE OF BEND: 1 = STRAIGHT, SHARP, MALE, 2 = STRAIGHT, SHARP, FEMALE; 3 = STRAIGHT, RADIAL MALE; 4 = STRAIGHT, RADIAL, FEMALE; 5 = CURVED, STRETCH FLANGE (TAPE); 6 = CURVED, SHRINK FLANGE (TAPE), 7 = CURVED (WOVEN MATERIAL)

MATERIAL FORM: 1 = UNIDIRECTIONAL TAPE, 2 = WOVEN

MATERIAL TYPE: 1 = GRAPHITE/EPOXY, 2 = FIBERGLASS/EPOXY

ACCEM-3 PART CONSOLIDATION

CYCLE NUMBER 1

CARD 1

PART NAME (1)	PART NUMBER (21)	QUANTITY (41)
T.E. FLAP SKINS	350-15	0.02

COMPONENT DETAIL PARTS

NUMBER OF LINES USED (51) 1 (MAXIMUM 10)

CARD 2

PART NAME (1)	PART NUMBER (21)	QUANTITY (41)
T.E. FLAP SKIN	350-15	0.01

CONSOLIDATION OF DETAILS

CARD 3

ADHESIVE (CIRCLE ONE) — NO: (1) 0 YES: (1) 1

APPLICATION AREA: (2) ____ SQ. IN.

ADDITIONAL OPERATIONS (CIRCLE IF APPLICABLE) — BONDING: (11) 1 SPLICING: (11) 2

CURING PROCESS

VACUUM BAGGING

TYPE OF BAG: (CIRCLE ONE) — DISPOSABLE: (12) 1 REUSABLE: (12) 2

RESIN BLEED: (CIRCLE ONE) — NO: (13) 0 YES: (13) 1

PLY-TO-BLEEDER RATIO: (14) 3 -TO-1

BAGGING AREA: (15) 2400 SQ. IN.

SEALING/CLAMPING PERIMETER: (31) 254 IN.

THERMAL EXPANSION MOLDING

EXTERNAL MOLD CAGE DIMENSIONS: LENGTH: (41) ____ IN.

WIDTH: (61) ____ IN.

DEPTH: (81) ____ IN.

CURING TOOL: (CIRCLE ONE) — AUTOCLAVE: (71) 1

OVEN: 2

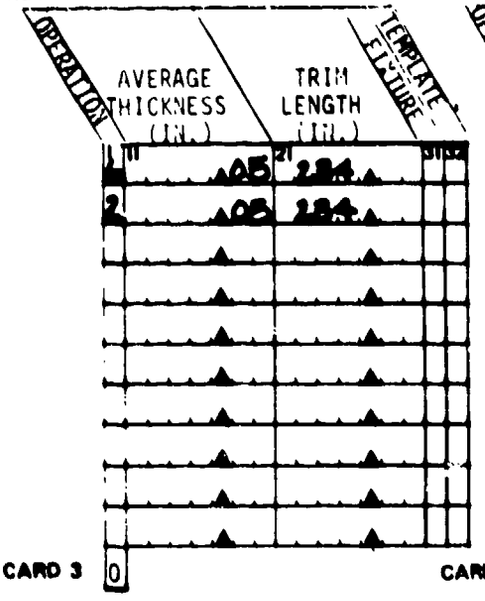
HEATING ELEMENT: 3

ACCEM-4 FINISHING OPERATIONS

CARD 1 PART NAME T.E. FLAP SKIN | PART NUMBER 20,21 550-15 | QTY. 40,41,42 120

PART AREA 6400 SQ. IN.

CARD 2 (OMIT IF LEFT BLANK)
NET TRIM OPERATIONS



CARD 3 0

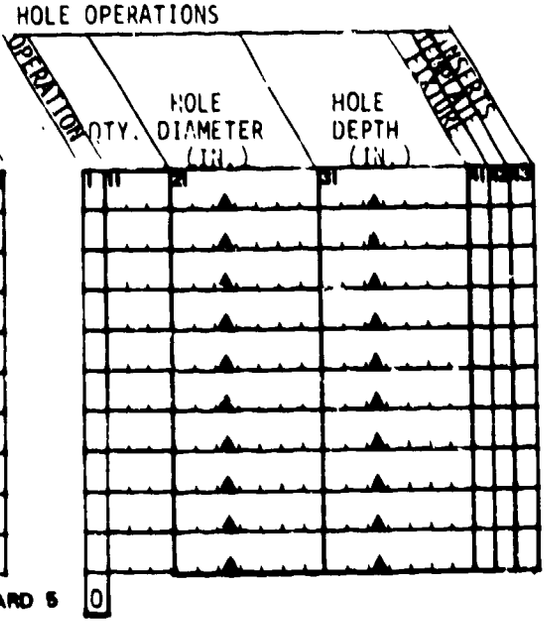
LEGEND

OPERATION: 1 = HAND ROUTING
2 = MACHINE ROUTING
3 = HAND SAWING
4 = MACHINE SAWING
5 = HAND SANDING
6 = PORTABLE TOOL SANDING
7 = MACHINE SANDING

FIXTURE: 0 = NO,
1 = YES

TEMPLATE: 0 = NO
1 = YES

CARD 4 (OMIT IF LEFT BLANK)
HOLE OPERATIONS



CARD 5 0

LEGEND

OPERATION: 1 = DRILLING
2 = COUNTERBORING
3 = REAMING
4 = COUNTERSINKING
5 = HOLE SAWING
6 = HOLE PUNCHING

FIXTURE: 0 = NO
1 = EXTERNAL
2 = INTERNAL

TEMPLATE: 0 = NO
1 = YES

INSERTS: 0 = NO
1 = YES

ACCEM-5 COST PROJECTION

CARD 1

UNIT NUMBER 01000.
AVE. LOT SIZE 20.

TYPE OF ESTIMATE

UNIT COST	COL. 21 NO 0	YES 1	(CIRCLE ONE)
CUMULATIVE AVERAGE COST	COL. 22 NO 0	YES 1	(CIRCLE ONE)
CUMULATIVE TOTAL COST	COL 23 NO 0	YES 1	(CIRCLE ONE)

CARD 2

FACTORY LABOR PROJECTION FACTORS

LEARNING CURVE: LOG-LINEAR UNIT 0 (col 24) CUM. AVE. 1 (col 24) (CIRCLE ONE)

DATA INPUT OPTIONS (CIRCLE ONE) COL. 1

NONE 0
ITEM (a) - (d) 1
ITEM (e) 2

CARD 3 T_1 VARIANCE

CARD 4 LEARNING CURVE SLOPE

(a) LAYUP
(b) CORE PREPARATION
(c) PART CONSOLIDATION
(d) FINISHING OPERATIONS
(e) TOTAL FACTORY LABOR

DATA INPUT OPTIONS (CIRCLE ONE) 2

NONE 0
ITEMS (a) - (f) 1

CARD 5

LABOR RATES

(a) FACTORY LABOR $/HR
(b) QUALITY CONTROL $/HR
(c) TOOLING $/HR
(d) MFG. ENG. $/HR
(e) ENGINEERING $/HR
(f) GRAPHIC SERVICES $/HR

DATA INPUT OPTIONS (CIRCLE ONE) 3

NONE 0
CARDS (6) - (8) 1
CARD (9) 2

SUPPORT FUNCTIONS

	CARD 6 BASE	**CARD 7** BASE UNIT
QUALITY CONTROL	2	2
TOOLING	3	3
MFG. ENG.	4	4
ENGINEERING	5	5
GRAPHIC SERVICES	6	6
SUPPORT MATERIAL		

CARD 8 FACTOR

CARD 9 LABOR HRS/MAT'L $'S

DATA INPUT OPTIONS (CIRCLE ONE) 4

NONE 0
ITEMS (a) - (f), (1), (2), (3) 1
ITEMS (1), (2), (3) 2

OVERHEAD RATES

(a) FACTORY FABRICATION
(b) QUALITY CONTROL
(c) TOOLING
(d) MFG. ENG.
(e) ENGINEERING
(f) GRAPHIC SERVICES
(1) TOTAL LABOR
(2) MATERIAL
(3) ADMINISTRATIVE

CARD 10

CARD 11

ACCEM-5 COST PROJECTION

CARD 1

UNIT NUMBER 01000
AVE. LOT SIZE 20

TYPE OF ESTIMATE

UNIT COST	COL. 21 NO 0	YES 1	(CIRCLE ONE)
CUMULATIVE AVERAGE COST	COL. 22 NO 0	YES 2	(CIRCLE ONE)
CUMULATIVE TOTAL COST	COL. 23 NO 0	YES 3	(CIRCLE ONE)

CARD 2

FACTORY LABOR PROJECTION FACTORS

LEARNING CURVE: LOG-LINEAR UNIT 24 0 CUM. AVE. 24 2 (CIRCLE ONE)

DATA INPUT OPTIONS (CIRCLE ONE) COL. 1

NONE 0
ITEM (a) - (d) 1
ITEM (e) 2

CARD 3 — T_1 VARIANCE

(a) LAYUP	
(b) CORE PREPARATION	
(c) PART CONSOLIDATION	
(d) FINISHING OPERATIONS	
(e) TOTAL FACTORY LABOR	21.25

CARD 4 — LEARNING CURVE SLOPE

(a) LAYUP	%
(b) CORE PREPARATION	%
(c) PART CONSOLIDATION	%
(d) FINISHING OPERATIONS	%
(e) TOTAL FACTORY LABOR	78.5 %

DATA INPUT OPTIONS (CIRCLE ONE) 2

NONE 0
ITEMS (a) - (f) 1

CARD 5

LABOR RATES

(a) FACTORY LABOR	12 $/HR
(b) QUALITY CONTROL	$/HR
(c) TOOLING	$/HR
(d) MFG. ENG.	$/HR
(e) ENGINEERING	$/HR
(f) GRAPHIC SERVICES	$/HR

DATA INPUT OPTIONS (CIRCLE ONE) 3

NONE 0
CARDS (6) - (8) 1
CARD (9) 2

SUPPORT FUNCTIONS

	CARD 6 BASE	CARD 7 BASE UNIT	CARD 8 FACTOR	CARD 9 LABOR HRS/MAT'L $'S
QUALITY CONTROL	2	2		15
TOOLING	3	3		1.2.5
MFG. ENG.	4	4		1.25
ENGINEERING	5	5		5
GRAPHIC SERVICES	6	6		.05
SUPPORT MATERIAL				.27

LEGEND

BASE: 1 = FACTORY FABRICATION, 2 = QUALITY CONTROL, 3 = TOOLING, 4 = MFG. ENG. 5 = ENGINEERING, 6 = GRAPHIC SERVICES, 7 = PRODUCTION MAT'L

BASE UNIT: 1 = HOURS, 2 = DOLLARS

DATA INPUT OPTIONS (CIRCLE ONE) 4

NONE 0
ITEMS (a) - (f), (2), (3) 1
ITEMS (1), (2), (3) 2

OVERHEAD RATES

CARD 10

(a) FACTORY FABRICATION	
(b) QUALITY CONTROL	
(c) TOOLING	
(d) MFG. ENG.	
(e) ENGINEERING	
(f) GRAPHIC SERVICES	

CARD 11

(1) TOTAL LABOR	1.75
(2) MATERIAL	.25
(3) ADMINISTRATIVE	.10

ADVANCED COMPOSITE COST ESTIMATE

ESTIMATOR: J.A. LORENZANA DATE: 09/23/76

ESTIMATE NUMBER: NAD-3901-5

PART NAME: T.E. FLAP SKINS

PART NUMBER: 356-15

INPUT FORMS	QUANTITY
LAYUP	1
HONEYCOMB CORE OPERATION	0
PART CONSOLIDATION	1
FINISHING OPERATIONS	1
COST PROJECTIONS	2

LAYUP

PART NAME: T.E. FLAP SKINS
PART NUMBER: 350-15
LAYUP TOOL = CURING TOOL

QTY: 2
TRIM ALLOWANCE: 1.00

MATERIAL DATA

	DENSITY	COST
GRAPHITE--3" TAPE	0.000400	87.00
GRAPHITE--12" TAPE	0.000400	87.00
GRAPHITE--WOVEN	0.000880	93.00
FIBERGLASS--3" TAPE	0.000540	8.70
FIBERGLASS--12" TAPE	0.000540	8.70
FIBERGLASS--WOVEN	0.001040	9.30

PLY DESCRIPTION

					BEND DATA			RECT		NON-RECT			MATL	
LD	#P	LH	DT	TB	LENGTH	CR	FW	CRI	CT	LENGTH	WIDTH	AREA	DIST	F T WD
2	0	1	2	0	0.0	0.0	0.0	45	2	68.00	49.00	0.0	0.0	1 1 12.
2	0	1	2	0	0.0	0.0	0.0	0	1	68.00	22.00	0.0	0.0	1 1 12.
2	0	1	2	0	0.0	0.0	0.0	90	1	68.00	43.00	0.0	0.0	1 1 12.
2	0	1	2	0	0.0	0.0	0.0	0	1	68.00	49.00	0.0	0.0	1 1 12.
2	0	1	2	0	0.0	0.0	0.0	0	1	49.00	28.00	0.0	0.0	1 1 12.
2	0	1	2	0	0.0	0.0	0.0	0	1	32.50	22.50	0.0	0.0	1 1 12.
2	0	1	2	0	0.0	0.0	0.0	45	2	68.00	33.00	0.0	0.0	1 1 12.
2	0	1	2	0	0.0	0.0	0.0	0	1	40.50	25.00	0.0	0.0	1 1 12.
2	0	1	2	0	0.0	0.0	0.0	0	1	68.00	35.00	0.0	0.0	1 1 12.
2	0	1	2	0	0.0	0.0	0.0	0	1	68.00	49.00	0.0	0.0	1 1 12.
2	0	1	2	0	0.0	0.0	0.0	90	1	68.00	30.00	0.0	0.0	1 1 12.
2	0	1	2	0	0.0	0.0	0.0	45	2	68.00	29.00	0.0	0.0	1 1 12.

LAYUP

FACTORY STANDARD HOURS	SET-UP	RUN
CLEAN LAYUP TOOL	0.0	0.050
APPLY RELEASE AGENT	0.0	0.076
POSITION MYLAR	0.0	1.425
PLY DEPOSITION	0.050	5.157
TRANS TO LAYUP TOOL	0.0	0.879
SUBTOTAL	0.050	7.587
TOTAL LAYUP	0.050	7.587
	********	********
BEND FACTOR HOURS		0.0

MATERIAL	USAGE (SQ.IN.)	SCRAP (SQ.IN.)	PERCENT SCRAP
GRAPHITE—12" TAPE	83503.12	16071.64	23.83

	WEIGHT	COST
GRAPHITE—12" TAPE	26.97	2346.61

PART CONSOLIDATION

CYCLE NO.: 1
PART NAME: T.E. FLAP SKINS
PART NUMBER: 350-15 QTY: 2

COMPONENT DETAIL PARTS

PART NAME	PART NO.	QTY
T.E. FLAP SKINS	350-15	1

VACUUM BAGGING: DISPOSABLE
RESIN BLEED PLIES-TO-BLEEDER RATIO: 3.0
BAGGING AREA: 3400.00
SEALING/CLAMPING PERIMETER: 234.00

CURING TOOL: AUTOCLAVE

PART CONSOLIDATION

FACTORY STANDARD HOURS	SET-UP	RUN
SET UP	0.070	
BEFORE CURE		
APPLY POROUS FILM		0.061
APPLY BLEEDER PLIES		1.113
APPLY NONPOROUS FILM		0.061
APPLY VENT CLOTH		0.136
INSTALL VACUUM FTGS		0.029
INSTALL THERMOCPLS		0.065
APPLY SEAL STRIPS		0.075
APPLY DISPOSABLE BAG		0.041
SEAL EDGES		0.253
CONNECT VACUUM LINES		0.012
SMOOTH BAG DOWN		0.041
CHECK SEALS		0.080
REMOVE VACUUM LINE		0.006
CHECK CHAMBER INT.		0.060
LOAD LAYUP IN AUTO.		0.118
CONNECT VACUUM LINES		0.024
CONNECT T.C. LEADS		0.037
CHECK FOR LEAKS		0.202
CLOSE DOOR		0.038
DURING CURE		
SET RECORDERS		0.028
CYCLE CHECK		0.160
SHUT DOWN		0.007
REMOVE CHARTS		0.007
AFTER CURE		
OPEN DOOR		0.038
RELEASE T.C. LEADS		0.014
RELEASE VAC. LINES		0.012
REMOVE PART FR AUTO.		0.092
REMOVE DISP. BAG		0.020
REMOVE THERMOCOUPLES		0.038
REMOVE VACUUM FTGS		0.012
REMOVE PROCESS MATL		0.224
REMOVE LAYUP & ASIDE		0.041
CLEAN TOOL		0.041
TOTAL HOURS	0.070	3.183
	********	********

FINISHING

PART NAME: T.E. FLAP SKINS
PART NUMBER: 350-15
PERIMETER: 234.00

QTY: 2
PART AREA: 3400.00

NET TRIM OPERATIONS

	MATERIAL(IN.)			
CODE	AVE. THICK.	TRIM LENGTH	FIXT.	TEMP.
6	0.05	234.00	0	0
2	0.05	234.00	0	0

FINISHING

FACTORY STANDARD HOURS	SET-UP	RUN
NET TRIM OPERATIONS		
MACHINE ROUTING	0.200	0.702
HANDLING		0.068
SUBTOTAL		0.770
PORT. TOOL SANDING	0.020	0.028
HANDLING		0.068
SUBTOTAL		0.096
HOLE OPERATIONS		
TOTAL HOURS	0.220	0.866
	********	********

TOTAL FACTORY LABOR STANDARD HOURS

FACTORY STANDARD HOURS	SET-UP	RUN
LAYUP	0.050	7.587
HONEYCOMB CORE PREP	0.0	0.0
PART CONSOLIDATION	0.070	3.183
FINISHING OPERATIONS	0.220	0.866
TOTAL HOURS	0.340	11.636
	********	********

COST PROJECTION

PRODUCTION COST ESTIMATE AT UNIT NO.: 1000
AVERAGE LOT SIZE: 20.
LINEAR UNIT CURVE

PROJECTION FACTORS	T1.VAR	CURVE SLOPE
LAYUP	23.24	76.63 %
HONEYCOMB CORE PREP	16.63	0.0 %
PART CONSOLIDATION	25.06	76.52 %
FINISHING OPERATIONS	23.84	76.77 %

LABOR RATES	$/HR
FACTORY LABOR	10.00
QUALITY CONTROL	10.00
TOOLING	10.00
MFG ENGINEERING	10.00
ENGINEERING	10.00
GRAPHIC SERVICES	10.00

SUPPORT FUNCTIONS	BASE		FACTORS
QUALITY CONTROL	1	1	1.41
TOOLING	1	1	4.22
MFG ENGINEERING	1	1	2.55
ENGINEERING	1	1	1.64
GRAPHIC SERVICES	1	1	0.40
SUPPORT MATERIAL	7	2	0.30

OVERHEAD RATES	
FACTORY LABOR	1.500
QUALITY CONTROL	1.500
TOOLING	1.500
MFG ENGINEERING	1.500
ENGINEERING	1.700
GRAPHIC SERVICES	1.700
MATERIAL	0.200
ADMINISTRATIVE	0.150

COST PROJECTION

UNIT COST ESTIMATE AT T 1000

COST ELEMENT	STD. HRS	T 1000 HRS	DOLLARS
FACTORY LABOR			
LAYUP	7.59	12.43	124.28
HONEYCOMB CURE PREP	0.0	0.0	0.0
PART CONSOLIDATION	3.19	5.55	55.46
FINISHING OPERATIONS	0.88	1.50	15.00
TOTAL FACTORY LABOR	11.65	19.47	194.74
SUPPORT LABORS			
QUALITY CONTROL		1.42	14.23
TOOLING		0.68	6.77
MFG ENGINEERING		1.04	10.36
ENGINEERING		0.53	5.28
GRAPHIC SERVICES		0.24	2.36
TOTAL SUPPORT LABOR			39.00
LABOR OVERHEAD			
FACTORY LABOR			
QUALITY CONTROL			202.11
TOOLING			21.34
MFG ENGINEERING			10.16
ENGINEERING			15.54
GRAPHIC SERVICES			8.98
TOTAL OVERHEAD			4.01
			352.14
TOTAL LABOR			585.88
MATERIAL			
PRODUCTION MATERIAL			
SUPPORT MATERIAL			2346.61
MFG. ALLOWANCE			703.98
OVERHEAD			563.19
TOTAL MATERIAL			722.76
			4336.54
ADMINISTRATIVE OVERHEAD			738.36
TOTAL COST			5660.78
			**********

	WEIGHT
LAYUP	26.97
HONEYCOMB CORE PREP	0.0
TOTAL	26.97

COST PROJECTION

CUMULATIVE AVERAGE COST ESTIMATE AT T 1000

COST ELEMENT	STD. HRS	T 1000 HRS	DOLLARS
FACTORY LABOR	7.59	20.13	201.33
LAYUP	0.0	0.0	0.0
HONEYCOMB CORE PREP	3.19	9.01	90.12
PART CONSOLIDATION	0.88	2.42	24.21
FINISHING OPERATIONS	11.65	31.57	315.66
TOTAL FACTORY LABOR			
SUPPORT LABORS		3.48	34.77
QUALITY CONTROL		2.66	26.63
TOOLING		4.14	41.42
MFG ENGINEERING		1.82	18.16
ENGINEERING		0.53	5.26
GRAPHIC SERVICES			126.24
TOTAL SUPPORT LABOR			
LABOR OVERHEAD			473.49
FACTORY LABOR			52.15
QUALITY CONTROL			39.94
TOOLING			62.13
MFG ENGINEERING			30.87
ENGINEERING			8.94
GRAPHIC SERVICES			667.53
TOTAL OVERHEAD			
TOTAL LABOR			1109.43
MATERIAL			2346.61
PRODUCTION MATERIAL			703.98
SUPPORT MATERIAL			565.61
MFG. ALLOWANCE			723.24
OVERHEAD			4339.44
TOTAL MATERIAL			
ADMINISTRATIVE OVERHEAD			817.33
TOTAL COST			6266.20
			**********

	WEIGHT
LAYUP	26.97
HONEYCOMB CORE PREP	0.0
TOTAL	26.97

COST PROJECTION

CUMULATIVE COST ESTIMATE AT T 1000

COST ELEMENT	STD. HRS	T 1000 HRS	DOLLARS
FACTORY LABOR			
LAYUP	7.59	20133.43	201334.25
HONEYCOMB CORE PREP	0.0	0.0	0.0
PART CONSULIDATION	3.19	9012.01	90120.06
FINISHING OPERATIONS	0.88	2420.93	24209.29
TOTAL FACTORY LABOR	11.65	31566.36	315663.56
SUPPORT LABORS			
QUALITY CONTROL		3476.96	34769.57
TOOLING		2662.67	26626.65
MFG ENGINEERING		4142.32	41423.16
ENGINEERING		1816.12	18161.23
GRAPHIC SERVICES		525.65	5256.50
TOTAL SUPPORT LABOR			126237.00
LABOR OVERHEAD			
FACTORY LABOR			473495.31
QUALITY CONTROL			52154.36
TOOLING			39939.98
MFG ENGINEERING			62134.75
ENGINEERING			30874.09
GRAPHIC SERVICES			8936.04
TOTAL OVERHEAD			667534.31
TOTAL LABOR			1109434.00
MATERIAL			
PRODUCTION MATERIAL			2346613.00
SUPPORT MATERIAL			703983.87
MFG. ALLOWANCE			6872.56
OVERHEAD			611493.56
TOTAL MATERIAL			3668961.00
ADMINISTRATIVE OVERHEAD			716759.12
TOTAL COST			5495154.00 **********

	WEIGHT
LAYUP	26972.56
HONEYCOMB CORE PREP	0.0
TOTAL	26972.56

COST PROJECTION

PRODUCTION COST ESTIMATE AT UNIT NO.: 1000
AVERAGE LOT SIZE: 20.
LINEAR CUMULATIVE AVERAGE CURVE

PROJECTION FACTORS	T1.VAR	CURVE SLOPE
TOTAL FACTURY LABOR	21.25	78.50 %

LABOR RATES	$/HR
FACTORY LABOR	12.00
QUALITY CONTROL	12.00
TOOLING	12.00
MFG ENGINEERING	12.00
ENGINEERING	12.00
GRAPHIC SERVICES	12.00

SUPPORT FUNCTIONS	DOLLARS
QUALITY CONTROL	15.00
TOOLING	12.50
MFG ENGINEERING	1.25
ENGINEERING	5.00
GRAPHIC SERVICES	0.05
SUPPORT MATERIAL	27.00

OVERHEAD RATES	
TOTAL LABOR	1.750
MATERIAL	0.250
ADMINISTRATIVE	0.100

COST PROJECTION

UNIT COST ESTIMATE AT T 1000

COST ELEMENT	STD. HRS	T 1000 HRS	DOLLARS
FACTORY LABOR			
TOTAL FACTORY LABOR	11.65	14.45	173.34
SUPPORT LABORS			
QUALITY CONTROL			180.00
TOOLING			150.00
MFG ENGINEERING			15.00
ENGINEERING			60.00
GRAPHIC SERVICES			0.60
TOTAL SUPPORT LABOR			405.60
LABOR OVERHEAD			
TOTAL OVERHEAD			1013.15
TOTAL LABOR			1592.09
MATERIAL			
PRODUCTION MATERIAL			2346.61
SUPPORT MATERIAL			27.00
MFG. ALLOWANCE			6872.56
OVERHEAD			2311.54
TOTAL MATERIAL			11557.71
ADMINISTRATIVE OVERHEAD			1314.98
TOTAL COST			14464.79
			**********

	WEIGHT
LAYUP	26.97
HONEYCOMB CORE PREP	0.0
TOTAL	26.97

•COST PROJECTION

CUMULATIVE AVERAGE COST ESTIMATE AT T 1000

COST ELEMENT	STD. HRS	T 1000 HRS	DOLLARS
FACTORY LABOR			
TOTAL FACTORY LABOR	11.65	22.19	266.23
SUPPORT LABORS			
QUALITY CONTROL			180.00
TOOLING			150.00
MFG ENGINEERING			15.00
ENGINEERING			60.00
GRAPHIC SERVICES			0.60
TOTAL SUPPORT LABOR			405.60
LABOR OVERHEAD			
TOTAL OVERHEAD			1175.70
TOTAL LABOR			1847.53
MATERIAL			
PRODUCTION MATERIAL			2346.61
SUPPORT MATERIAL			27.00
MFG. ALLOWANCE			6872.56
OVERHEAD			2311.54
TOTAL MATERIAL			11557.71
ADMINISTRATIVE OVERHEAD			1340.52
TOTAL COST			14745.77
			**********

	WEIGHT
LAYUP	26.97
HONEYCOMB CURE PREP	0.0
TOTAL	26.97

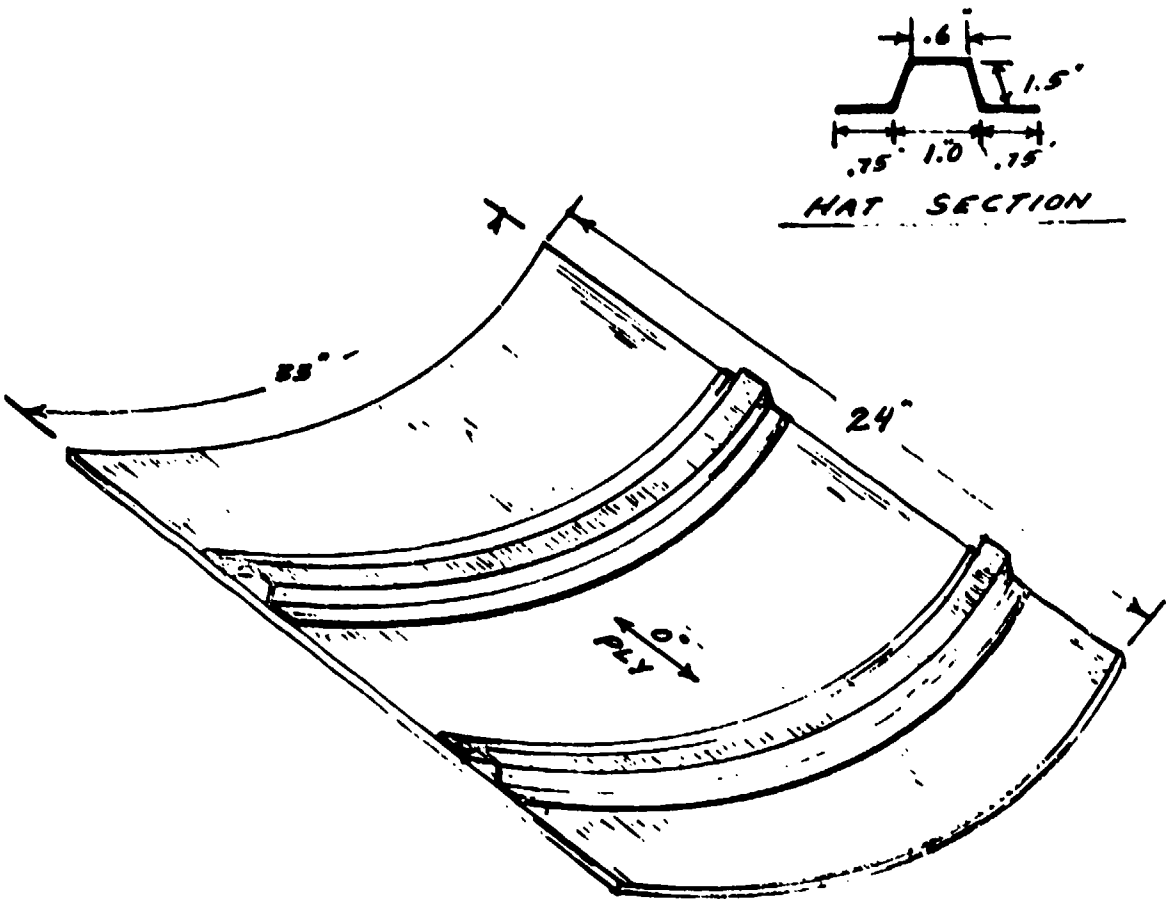
COST PROJECTION

CUMULATIVE COST ESTIMATE AT T 1000

COST ELEMENT	STD. HRS	T 1000 HRS	DOLLARS
FACTORY LABOR			
TOTAL FACTORY LABOR	11.65	22185.90	266230.81
SUPPORT LABORS			
QUALITY CONTROL			180.00
TOOLING			150.00
MFG ENGINEERING			15.00
ENGINEERING			60.00
GRAPHIC SERVICES			0.60
TOTAL SUPPORT LABOR			405.60
LABOR OVERHEAD			
TOTAL OVERHEAD			466613.62
TOTAL LABOR			733250.00
MATERIAL			
PRODUCTION MATERIAL			2346613.00
SUPPORT MATERIAL			27.00
MFG. ALLOWANCE			6872.56
OVERHEAD			588378.00
TOTAL MATERIAL			2941890.00
ADMINISTRATIVE OVERHEAD			367514.06
TOTAL COST			4042654.00
			**********

	WEIGHT
LAYUP	26972.56
HONEYCOMB CORE PREP	0.0
TOTAL	26972.56

HAT STIFFENED PANEL ASSEMBLY



MANUFACTURING PLAN

1. The following list of details makes up the hat stiffened lower panel assembly.
   a. Composite lower skin
   b. Composite hat stiffener (2 required)

2. Materials
   a. Thornel 300/SP288 graphite/epoxy per NAI-1332
   b. Narmco 3203 fiberglass/epoxy

3. Layup and Cocure of Skin and Precured Hat Stiffeners

a. The composite skin is composed of 6 ply $(0_{GR}/90_{GR}/+45_{GL})_S$ layed up in the flat with the outer skin being draped into the release coated (Fre - Kote 33) female lower panel cocuring tool.

b. The No. 2 composite ply shall be draped and formed over the No. 1 composite ply (ply-on-ply), this sequence shall continue until the build-up of all plies is completed.

c. The layed up composite skin shall be set aside for subsequent cocuring operations.

d. The No. 1 fiberglass ply of $(\pm 45_{GL})_S$ is layed up on the rubber curing tool utilized in thermal expansion molds. This procedure continues until the build-up of all plies is completed. The layup is then transferred to the elastomeric mold cage.

e. The encaged stiffener is subsequently placed in an oven for curing.

f. Upon removal of the component from the mold it shall be checked for conformity to previously determined dimensions.

g. The precured composite stiffener shall be positioned on the previously layed up skin assembly and resin tacked in place. No structural adhesive is required between the composite stiffeners and composite skin as resin bonding is accomplished during the cocuring operation.

h. Apply a layer of non-porous armalon over the entire layup and drape to shape of component.

i. Apply two layers of Osnaburg breather cloth over the layup and drape to shape of component.

j. The component shall be vacuum bagged using a reusable rubber vacuum bag and cocured at vacuum bag pressure (15 psi) only, in a oven with a cure temperature of 300 F for two hours as monitored by thermocouple.

h. Upon removal of the component from the bag, it will be exposed and check for conformity to previously determined dimensions and aerodynamic smoothness; any discrepancy will be recorded.

l. The component shall be delivered to Quality Control for NDT. All detectable voids shall be mapped and retained as part of inspection record.

m. The component shall be net trimmed to final dimensions and set aside for subsequent assembly operations.

ACCEM-0 INPUT CHECKLIST

CARD 1

ESTIMATOR NAME	[1]	A.H. KOKAWA
ESTIMATE NUMBER	[21]	CA 1976-9
PART NAME	[41]	HAT STIFF. PANEL
PART NUMBER	[61]	15-42937-61

CARD 2

INPUT FORMS		QUANTITY USED	
ACCEM-1	LAYUP	[1]	0.2
ACCEM-2	HONEYCOMB CORE PREPARATION	[3]	0.0
ACCEM-3	PART CONSOLIDATION	[5]	0.2
ACCEM-4	FINISHING OPERATIONS	[7]	0.1
ACCEM-5	COST PROJECTION	[9]	02

ACCEM-1 LAYUP

CARD 1 PART NAME STIFFENER (1) PART NUMBER -65 (21) QTY 002 (41)

TRIM ALLOWANCE .05 IN (61)

LAYUP TOOL SAME AS CURING TOOL (CIRCLE ONE) YES 1 NO 2 (81)

DEBULKING NUMBER OF OCCURRENCES (82)

TYPE OF BAG (CIRCLE ONE) DISPOSABLE 1 REUSABLE 2 (84)

CARD 2 (BLANK)

CARD 3

	GRAPHITE		FIBERGLASS	
	TAPE	WOVEN	TAPE	WOVEN
COST ($/LB)	1	11	21	31
DENSITY (LB/SQ.IN.)	41	51	61	71

KEYPUNCH CARD 4 AND CARD 5 ALTERNATELY

CARD 4

METHOD	BEND DESCRIPTION				
QUANTITY OF PREPLIES (1-9)	TYPE OF BEND (1-9)	BEND LENGTH (IN.)	RADIUS OF CURVATURE	FLANGE WIDTH (IN.)
1 (1)	1 (11)	4.0 (21)	1 (31)	2 (51)
9999				

CARD 5

PLY DESCRIPTION							
ORIENTATION (DEG.)	COUNT	DIMENSIONS				MATERIAL	
		RECTANGULAR		NONRECTANGULAR			
		LENGTH (IN.)	WIDTH (IN.)	AREA (SQ.IN.)	DISTANCE (IN.)	TYPE	WIDTH
045 (1)	004 (11)	60 (21)	6 (31)			1 (41)	9 (51)
000							

LAST ENTRY ON CARD 4 IS "9999"; LAST ENTRY ON CARD 5 IS "000"

LEGEND

HANDLING METHOD:	1 = PREPLY, 2 = DIRECT-ON-TOOL
LAYUP METHOD:	1 = MANUAL, 2 = HAND-ASSIST, 4 = CONRAC AUTOMATIC (720 IPM), 5 = CONRAC AUTOMATIC (360 IPM)
DEPOSITION TECHNIQUE:	1 = PLY-ON-PLY, 2 = PLY-ON-MYLAR
TYPE OF BEND:	1 = STRAIGHT, SHARP, MALE, 2 = STRAIGHT, SHARP, FEMALE; 3 = STRAIGHT, RADIAL MALE; 4 = STRAIGHT, RADIAL, FEMALE; 5 = CURVED, STRETCH FLANGE (TAPE); 6 = CURVED, SHRINK FLANGE (TAPE); 7 = CURVED (WOVEN MATERIAL)
MATERIAL FORM:	1 = UNIDIRECTIONAL TAPE, 2 = WOVEN
MATERIAL TYPE:	1 = GRAPHITE/EPOXY, 2 = FIBERGLASS/EPOXY

ACCEM-1 LAYUP

CARD 1 PART NAME SKIN | PART NUMBER 21-67 | QTY 001

TRIM ALLOWANCE ____ IN.

LAYUP TOOL SAME AS CURING TOOL (CIRCLE ONE) YES 1 NO 0

DEBULKING NUMBER OF OCCURRENCES 6

TYPE OF BAG (CIRCLE ONE) DISPOSABLE 1 REUSABLE 2

CARD 2 (BLANK)

CARD 3

	GRAPHITE TAPE	GRAPHITE WOVEN	FIBERGLASS TAPE	FIBERGLASS WOVEN
COST ($/LB)				
DENSITY (LB/SQ.IN.)				

KEYPUNCH CARD 4 AND CARD 5 ALTERNATELY

CARD 4

METHOD	BEND DESCRIPTION			
	QUANTITY OF PREPLIES	BEND LENGTH (IN.)	RADIUS OF CURVATURE	FLANGE WIDTH (IN.)

CARD 5

PLY DESCRIPTION					
		DIMENSIONS			
ORIENTATION (DEG.)	COUNT	RECTANGULAR		NONRECTANGULAR	MATERIAL
		LENGTH (IN.)	WIDTH (IN.)	AREA (SQ.IN.)	DISTANCE (IN.)
000	001	60	38		
000	001				
045	001				
000					

LAST ENTRY ON CARD 4 IS "9999"; LAST ENTRY ON CARD 5 IS "000"

LEGEND

HANDLING METHOD: 1 = PREPLY, 2 = DIRECT-ON-TOOL

LAYUP METHOD: 1 = MANUAL, 2 = HAND-ASSIST, 4 = CONRAC AUTOMATIC (720 IPM), 8 = CONRAC AUTOMATIC (360 IPM)

DEPOSITION TECHNIQUE: 1 = PLY-ON-PLY, 2 = PLY-ON-MYLAR

TYPE OF BEND: 1 = STRAIGHT, SHARP, MALE; 2 = STRAIGHT, SHARP, FEMALE; 3 = STRAIGHT, RADIAL MALE; 4 = STRAIGHT, RADIAL FEMALE; 5 = CURVED, SHRINK FLANGE (TAPE); 6 = CURVED, STRAIGHT FLANGE (TAPE); 7 = CURVED (WOVEN MATERIAL)

MATERIAL FORM: 1 = UNIDIRECTIONAL TAPE, 2 = WOVEN

MATERIAL TYPE: 1 = GRAPHITE/EPOXY, 2 = FIBERGLASS/EPOXY

ACCEM-3 PART CONSOLIDATION

CYCLE NUMBER 1

CARD 1

PART NAME	PART NUMBER	QUANTITY
PRECURED SPAR	-65	002

COMPONENT DETAIL PARTS

NUMBER OF LINES USED 01 (MAXIMUM 10)

CARD 2

PART NAME	PART NUMBER	QUANTITY
SPACER	-65	001

CARD 3

CONSOLIDATION OF DETAILS

ADHESIVE (CIRCLE ONE) — NO: (2) YES: 1

APPLICATION AREA: ____ SQ. IN.

ADDITIONAL OPERATIONS (CIRCLE IF APPLICABLE) — BONDING: 1 SPLICING: 2

CURING PROCESS

VACUUM BAGGING

TYPE OF BAG: (CIRCLE ONE) — DISPOSABLE: 1 REUSABLE: 2

RESIN BLEED: (CIRCLE ONE) — NO: 0 YES: 1

PLY-TO-BLEEDER RATIO: ____-TO-1

BAGGING AREA: ____ SQ. IN.

SEALING/CLAMPING PERIMETER: ____ IN.

THERMAL EXPANSION MOLDING

EXTERNAL MOLD CAGE DIMENSIONS:

LENGTH: 70 IN.

WIDTH: 12 IN.

DEPTH: 12 IN.

CURING TOOL: (CIRCLE ONE) — AUTOCLAVE: 1 OVEN: (2) HEATING ELEMENT: 3

ACCEM-3 PART CONSOLIDATION

CYCLE NUMBER 2

CARD 1

PART NAME (1)	PART NUMBER (21)	QUANTITY (41)
HAT STIFF. PANEL	15-42087-61	00.1

COMPONENT DETAIL PARTS

NUMBER OF LINES USED 02 (MAXIMUM 10)

CARD 2

PART NAME (1)	PART NUMBER (21)	QUANTITY (41)
PRECURED STIFF	-65	00.2
SKIN	-67	00.1

CONSOLIDATION OF DETAILS

CARD 3

ADHESIVE (CIRCLE ONE) — NO: (0) YES: 1

APPLICATION AREA: _____ SQ. IN.

ADDITIONAL OPERATIONS (CIRCLE IF APPLICABLE) — BONDING: 1 SPLICING: 2

CURING PROCESS

VACUUM BAGGING

TYPE OF BAG: (CIRCLE ONE) — DISPOSABLE: 1 REUSABLE: (2)

RESIN BLEED: (CIRCLE ONE) — NO: (0) YES: 1

PLY-TO-BLEEDER RATIO: _____ -TO-1

BAGGING AREA: 19.80 SQ. IN.

SEALING/CLAMPING PERIMETER. 1.86 IN.

THERMAL EXPANSION MOLDING

EXTERNAL MOLD CAGE DIMENSIONS:

LENGTH: _____ IN.

WIDTH: _____ IN.

DEPTH: _____ IN.

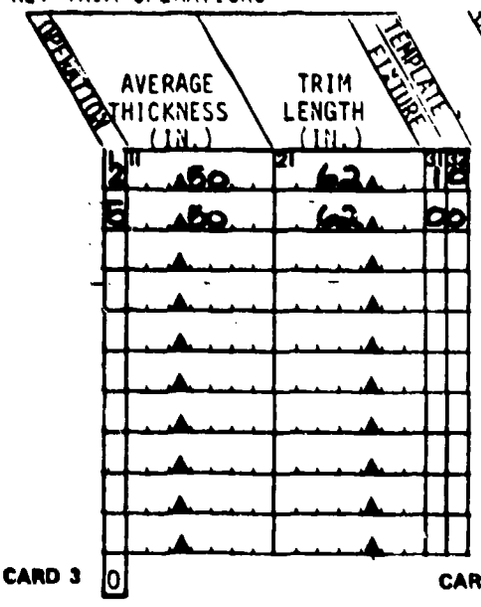
CURING TOOL: (CIRCLE ONE) — AUTOCLAVE: 1 OVEN: (2) HEATING ELEMENT: 3

ACCEM-4 FINISHING OPERATIONS

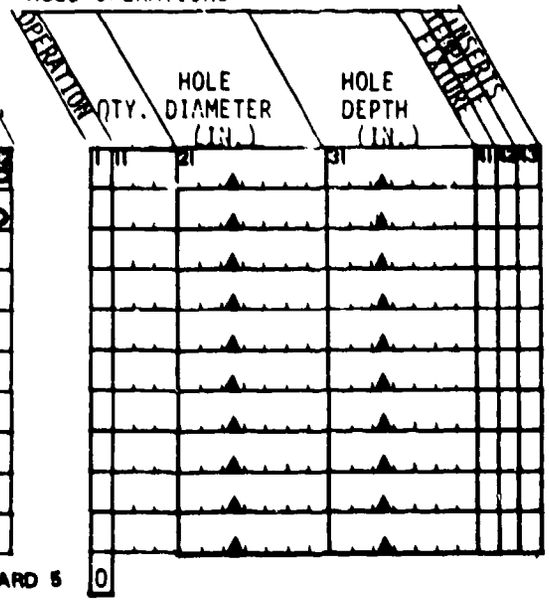
CARD 1 PART NAME (1) HAT STIFF. PANEL (20,21) PART NUMBER 15-42937-61 (40,41,43) QTY 001

(51) PART AREA 1188.0 SQ. IN.

CARD 2 (OMIT IF LEFT BLANK)
NET TRIM OPERATIONS



CARD 4 (OMIT IF LEFT BLANK)
HOLE OPERATIONS



LEGEND

OPERATION:
1 = HAND ROUTING
2 = MACHINE ROUTING
3 = HAND SAWING
4 = MACHINE SAWING
5 = HAND SANDING
6 = PORTABLE TOOL SANDING
7 = MACHINE SANDING

FIXTURE:
0 = NO,
1 = YES

TEMPLATE:
0 = NO
1 = YES

LEGEND

OPERATION:
1 = DRILLING
2 = COUNTERSINKING
3 = COUNTERBORING
4 = REAMING
5 = HOLE SAWING
6 = HOLE PUNCHING

FIXTURE:
0 = NO
1 = EXTERNAL
2 = INTERNAL

TEMPLATE:
0 = NO
1 = YES

INSERTS:
0 = NO
1 = YES

ACCEM-5 COST PROJECTION

CARD 1

UNIT NUMBER 00500.
AVE. LOT SIZE 30.

TYPE OF ESTIMATE

UNIT COST	COL. 21 NO 0	YES (1)	(CIRCLE ONE)
CUMULATIVE AVERAGE COST	COL. 22 NO 0	YES (1)	(CIRCLE ONE)
CUMULATIVE TOTAL COST	COL 23 NO 0	YES (1)	(CIRCLE ONE)

CARD 2

FACTORY LABOR PROJECTION FACTORS

LEARNING CURVE: LOG-LINEAR UNIT (1) CUM. AVE. 1 (CIRCLE ONE)

DATA INPUT OPTIONS (CIRCLE ONE) COL. 1

NONE
ITEM (a) - (e) 1
ITEM (e) 2

CARD 3 — T_1 VARIANCE

CARD 4 — LEARNING CURVE SLOPE

(a)	LAYUP
(b)	CORE PREPARATION
(c)	PART CONSOLIDATION
(d)	FINISHING OPERATIONS
(e)	TOTAL FACTORY LABOR

DATA INPUT OPTIONS (CIRCLE ONE) 2

NONE
ITEMS (a) - (f) 1

CARD 5

LABOR RATES

(a)	FACTORY LABOR	$/HR
(b)	QUALITY CONTROL	$/HR
(c)	TOOLING	$/HR
(d)	MFG. ENG.	$/HR
(e)	ENGINEERING	$/HR
(f)	GRAPHIC SERVICES	$/HR

DATA INPUT OPTIONS (CIRCLE ONE) 3

NONE
CARDS (6) - (8) 1
CARD (9) 2

SUPPORT FUNCTIONS

CARD 6 — BASE
CARD 7 — BASE UNIT
CARD 8 — FACTOR
CARD 9 — LABOR HRS/MAT'L $'S

QUALITY CONTROL
TOOLING
MFG. ENG.
ENGINEERING
GRAPHIC SERVICES
SUPPORT MATERIAL

LEGEND

BASE: 1 = FACTORY FABRICATION, 2 = QUALITY CONTROL, 3 = TOOLING, 4 = MFG. ENG., 5 = ENGINEERING, 6 = GRAPHIC SERVICES, 7 = PRODUCTION MAT'L

BASE UNIT: 1 = HOURS, 2 = DOLLARS

DATA INPUT OPTIONS (CIRCLE ONE) 4

NONE
ITEMS (a) - (f), (2), (3) 1
ITEMS (1), (2), (3) 2

OVERHEAD RATES

CARD 10

(a)	FACTORY FABRICATION	
(b)	QUALITY CONTROL	
(c)	TOOLING	
(d)	MFG. ENG.	
(e)	ENGINEERING	
(f)	GRAPHIC SERVICES	
	(1)	TOTAL LABOR
	(2)	MATERIAL
	(3)	ADMINISTRATIVE

CARD 11

ACCEM-5 COST PROJECTION

CARD 1

UNIT NUMBER 100300.
AVE. LOT SIZE 30.

TYPE OF ESTIMATE

UNIT COST	COL. 21 NO 0	YES (2)	(CIRCLE ONE)
CUMULATIVE AVERAGE COST	COL. 22 NO 0	YES (2)	(CIRCLE ONE)
CUMULATIVE TOTAL COST	COL 23 NO 0	YES (2)	(CIRCLE ONE)

CARD 2

FACTORY LABOR PROJECTION FACTORS

LEARNING CURVE: LOG-LINEAR UNIT (1) (24) CUM. AVE. 1 (24) (CIRCLE ONE)

DATA INPUT OPTIONS (CIRCLE ONE) COL. 1

NONE
ITEM (a) - (d) (1)
ITEM (e) (2)

CARD 3 — T_1 VARIANCE

(a) LAYUP	21.50
(b) CORE PREPARATION	28.75
(c) PART CONSOLIDATION	25.
(d) FINISHING OPERATIONS	21.
(e) TOTAL FACTORY LABOR	

CARD 4 — LEARNING CURVE SLOPE

(a) LAYUP	78. %
(b) CORE PREPARATION	85. %
(c) PART CONSOLIDATION	80. %
(d) FINISHING OPERATIONS	78. %
(e) TOTAL FACTORY LABOR	%

DATA INPUT OPTIONS (CIRCLE ONE) 2

NONE
ITEMS (a) - (f) (1)

LABOR RATES — CARD 5

(a) FACTORY LABOR	7.50 $/HR
(b) QUALITY CONTROL	6.00 $/HR
(c) TOOLING	6.00 $/HR
(d) MFG. ENG.	6.00 $/HR
(e) ENGINEERING	12.00 $/HR
(f) GRAPHIC SERVICES	9.00 $/HR

DATA INPUT OPTIONS (CIRCLE ONE) 3

NONE
CARDS (6) - (8) (1)
CARD (9) (2)

SUPPORT FUNCTIONS

	CARD 6 BASE	CARD 7 BASE UNIT	CARD 8 FACTOR	CARD 9 LABOR HRS/MAT'L $'S
QUALITY CONTROL	1	1	.15	
TOOLING	1	1	.15	
MFG. ENG.	3	1	.50	
ENGINEERING	1	1	.20	
GRAPHIC SERVICES	5	1	1.0	
SUPPORT MATERIAL	1	1	3.	

LEGEND
BASE: 1 = FACTORY FABRICATION, 2 = QUALITY CONTROL, 3 = TOOLING, 4 = MFG. ENG. 5 = ENGINEERING, 6 = GRAPHIC SERVICES, 7 = PRODUCTION MAT'L
BASE UNIT: 1 = HOURS, 2 = DOLLARS

DATA INPUT OPTIONS (CIRCLE ONE) 4

NONE
ITEMS (a) - (f), (2), (3) (1)
ITEMS (1), (2), (3) (2)

OVERHEAD RATES — CARD 10

(a) FACTORY FABRICATION	1.7
(b) QUALITY CONTROL	1.5
(c) TOOLING	1.5
(d) MFG. ENG.	1.5
(e) ENGINEERING	1.9
(f) GRAPHIC SERVICES	1.9
(1) TOTAL LABOR	
(2) MATERIAL	
(3) ADMINISTRATIVE	

CARD 11

(1) TOTAL LABOR	
(2) MATERIAL	.25
(3) ADMINISTRATIVE	.05

ADVANCED COMPOSITE COST ESTIMATE

ESTIMATOR: A.H. KOKAWA DATE: 09/23/76

ESTIMATE NUMBER: CA1976-9

PART NAME: HAT STIFF. PANEL

PART NUMBER: 15-42937-61

INPUT FORMS	QUANTITY
LAYUP	2
HONEYCOMB CORE OPERATION	0
PART CONSOLIDATION	2
FINISHING OPERATIONS	1
COST PROJECTIONS	2

LAYUP

PART NAME: STIFFENER
PART NUMBER: -65
LAYUP TOOL = CURING TOOL

QTY: 2
TRIM ALLOWANCE: 0.50

MATERIAL DATA

	DENSITY	COST
GRAPHITE--3" TAPE	0.000400	87.00
GRAPHITE--12" TAPE	0.000400	87.00
GRAPHITE--WOVEN	0.000860	93.00
FIBERGLASS--3" TAPE	0.000540	8.70
FIBERGLASS--12" TAPE	0.000540	8.70
FIBERGLASS--WOVEN	0.001040	9.30

PLY DESCRIPTION

					BEND DATA					RECT		NON-RECT		MATL		
LD	#P	LH	DT	TB	LENGTH	CR	FW	CRI	CT	LENGTH	WIDTH	AREA	DIST	F	T	WD
2	0	1	1	6	240.00	16.00	2.00	45	4	60.00	6.00	0.0	0.0	1	2	3.

LAYUP

FACTORY STANDARD HOURS	SET-UP	RUN
CLEAN LAYUP TOOL	0.0	0.005
APPLY RELEASE AGENT	0.0	0.008
PLY DEPOSITION	0.050	4.625
SUBTOTAL	0.050	4.638
TOTAL LAYUP	0.050	4.638
	*******	*******
BEND FACTOR HOURS		3.966

MATERIAL	USAGE (SQ.IN.)	SCRAP (SQ.IN.)	PERCENT SCRAP
FIBERGLASS--3" TAPE	3346.13	466.13	16.19

	WEIGHT	COST
FIBERGLASS--3" TAPE	1.56	13.53

LAYUP

PART NAME: SKIN
PART NUMBER: -67
LAYUP TOOL = CURING TOOL

QTY: 1
TRIM ALLOWANCE: 1.00

MATERIAL DATA

	DENSITY	COST
GRAPHITE--3" TAPE	0.000400	87.00
GRAPHITE--12" TAPE	0.000400	87.00
GRAPHITE--WOVEN	0.000680	93.00
FIBERGLASS--3" TAPE	0.000540	8.70
FIBERGLASS--12" TAPE	0.000540	8.70
FIBERGLASS--WOVEN	0.001040	9.30

PLY DESCRIPTION

					BEND DATA					RECT		NON-RECT		MATL		
LD	#P	LH	CT	TB	LENGTH	CR	FW	ORI	CT	LENGTH	WIDTH	AREA	DIST	F	T	WD
2	0	1	1	0	0.0	0.0	0.0	0	1	60.00	33.00	0.0	0.0	1	1	12.
2	0	1	1	0	0.0	0.0	0.0	90	1	60.00	33.00	0.0	0.0	1	1	12.
2	0	1	1	0	0.0	0.0	0.0	45	1	60.00	33.00	0.0	0.0	2	2	38.

LAYUP

FACTORY STANDARD HOURS	SET-UP	RUN
CLEAN LAYUP TOOL	0.0	0.015
APPLY RELEASE AGENT	0.0	0.023
PLY DEPOSITION	0.100	0.397
SUBTOTAL	0.100	0.435
TOTAL LAYUP	0.100	0.435
	*******	*******
BEND FACTOR HOURS		0.0

MATERIAL	USAGE (SQ.IN.)	SCRAP (SQ.IN.)	PERCENT SCRAP
GRAPHITE--12" TAPE	4752.00	792.00	20.00
FIBERGLASS--WOVEN	2440.29	460.29	23.25

	WEIGHT	COST
GRAPHITE--12" TAPE	1.58	127.81
FIBERGLASS--WOVEN	2.06	19.15

PART CONSOLIDATION

CYCLE NO.: 1
PART NAME: PRECURED STIFF
PART NUMBER: -65 QTY: 2

COMPONENT DETAIL PARTS

PART NAME	PART NO.	QTY
STIFFENER	-65	1

THERMAL EXPANSION MOLD CAGE DIMENSION:
LENGTH: 70.00
WIDTH: 12.00
DEPTH: 12.00

CURING TOOL: OVEN

PART CONSOLIDATION

FACTORY STANDARD HOURS	SET-UP	RUN
SET UP	0.100	
BEFORE CURE		
FIT LAYUPS INTO MOLD		0.010
CHECK OVEN INTERIOR		0.060
CLOSE DOOR		0.038
DURING CURE		
SET RECORDER		0.007
CYCLE CHECK		0.160
SHUT DOWN		0.017
REMOVE CHARTS		0.017
AFTER CURE		
OPEN DOOR		0.038
REMOVE PART FR CAGE		0.017
ASIDE PART		0.003
TOTAL HOURS	0.100	0.467
	********	********

PART CONSOLIDATION

CYCLE NO.: 2
PART NAME: HAT STIFF. PANEL
PART NUMBER: 15-42937-61 QTY: 1

COMPONENT DETAIL PARTS

PART NAME	PART NO.	QTY
PRECURED STIFF	-65	2
SKIN	-67	1

VACUUM BAGGING: REUSABLE
BAGGING AREA: 1980.00 SEALING/CLAMPING PERIMETER: 186.00

CURING TOOL: OVEN

PART CONSOLIDATION

FACTORY STANDARD HOURS	SET-UP	RUN
SET UP	0.050	
BEFORE CURE		
PREFIT DETAILS		0.144
ASSEMBLE DETAILS		0.044
APPLY NONPOROUS FILM		0.018
APPLY VENT CLOTH		0.040
INSTALL THERMOCPLS		0.032
APPLY REUSABLE BAG		0.030
CLAMP EDGES		0.043
CONNECT VACUUM LINES		0.006
SMOOTH BAG DOWN		0.012
CHECK SEALS		0.032
REMOVE VACUUM LINE		0.003
CHECK CHAMBER INT.		0.030
LOAD LAYUP IN OVEN		0.077
CONNECT VACUUM LINES		0.012
CONNECT T.C. LEADS		0.018
CHECK FOR LEAKS		0.080
CLOSE DOOR		0.019
DURING CURE		
SET RECORDERS		0.004
CYCLE CHECK		0.080
SHUT DOWN		0.001
REMOVE CHARTS		0.001
AFTER CURE		
OPEN DOOR		0.019
RELEASE T.C. LEADS		0.007
RELEASE VAC. LINES		0.006
REMOVE PART FR OVEN		0.077
RELEASE CLAMPS		0.013
REMOVE REUS. BAG		0.016
REMOVE THERMOCOUPLES		0.019
REMOVE PROCESS MATL		0.036
REMOVE LAYUP & ASIDE		0.012
CLEAN TOOL		0.012
TOTAL HOURS	0.050	0.944
	********	********

FINISHING

PART NAME: HAT STIFF. PANEL
PART NUMBER: 15-42937-61
PERIMETER: 186.00

QTY: 1
PART AREA: 1960.00

NET TRIM OPERATIONS

	MATERIAL(IN.)			
CODE	AVE. THICK.	TRIM LENGTH	FIXT.	TEMP.
2	0.50	62.00	1	0
5	0.50	62.00	0	0

FINISHING

FACTORY STANDARD HOURS	SET-UP	RUN
NET TRIM OPERATIONS		
MACHINE ROUTING	0.200	0.093
HANDLING		0.137
SUBTOTAL		0.230
HAND SANDING	0.020	0.031
HANDLING		0.024
SUBTOTAL		0.055
HOLE OPERATIONS		
TOTAL HOURS	0.220	0.285
	********	********

TOTAL FACTORY LABOR STANDARD HOURS

FACTORY STANDARD HOURS	SET-UP	RUN
LAYUP	0.150	5.073
HONEYCOMB CORE PREP	0.0	0.0
PART CONSOLIDATION	0.150	1.412
FINISHING OPERATIONS	0.220	0.285
TOTAL HOURS	0.520	6.769

COST PROJECTION

PRODUCTION COST ESTIMATE AT UNIT NO.: 300
AVERAGE LOT SIZE: 30.
LINEAR UNIT CURVE

PROJECTION FACTORS	11.VAR	CURVE SLOPE
LAYUP	23.24	76.63 %
HONEYCOMB CORE PREP	16.83	0.0 %
PART CONSOLIDATION	25.06	76.52 %
FINISHING OPERATIONS	23.84	76.77 %

LABOR RATES	$/HR
FACTORY LABOR	10.60
QUALITY CONTROL	10.00
TOOLING	10.00
MFG ENGINEERING	10.00
ENGINEERING	10.00
GRAPHIC SERVICES	10.00

SUPPORT FUNCTIONS	BASE		FACTORS
QUALITY CONTROL	1	1	1.14
TOOLING	1	1	3.09
MFG ENGINEERING	1	1	2.05
ENGINEERING	1	1	1.26
GRAPHIC SERVICES	1	1	0.31
SUPPORT MATERIAL	7	2	0.30

OVERHEAD RATES	
FACTORY LABOR	1.500
QUALITY CONTROL	1.500
TOOLING	1.500
MFG ENGINEERING	1.500
ENGINEERING	1.700
GRAPHIC SERVICES	1.700
MATERIAL	0.200
ADMINISTRATIVE	0.150

COST PROJECTION

UNIT COST ESTIMATE AT T 300

COST ELEMENT	STD. HRS	T 300 HRS	DOLLARS
FACTORY LABOR			
LAYUP	5.08	13.20	132.02
HONEYCOMB CORE PREP	0.0	0.0	0.0
PART CONSOLIDATION	1.42	3.93	39.28
FINISHING OPERATIONS	0.29	0.79	7.91
TOTAL FACTORY LABOR	6.79	17.92	179.18
SUPPORT LABORS			
QUALITY CONTROL		1.72	17.24
TOOLING		1.03	10.33
MFG ENGINEERING		1.59	15.91
ENGINEERING		0.76	7.60
GRAPHIC SERVICES		0.27	2.71
TOTAL SUPPORT LABOR			53.79
LABOR OVERHEAD			
FACTORY LABOR			268.77
QUALITY CONTROL			25.86
TOOLING			15.50
MFG ENGINEERING			23.87
ENGINEERING			12.91
GRAPHIC SERVICES			4.61
TOTAL OVERHEAD			351.52
TOTAL LABOR			584.49
MATERIAL			
PRODUCTION MATERIAL			170.49
SUPPORT MATERIAL			51.15
MFG. ALLOWANCE			37.79
OVERHEAD			51.88
TOTAL MATERIAL			311.31
ADMINISTRATIVE OVERHEAD			134.37
TOTAL COST			1030.16
			**********

	WEIGHT
LAYUP	5.20
HONEYCOMB CORE PREP	0.0
TOTAL	5.20

COST PROJECTION

CUMULATIVE AVERAGE COST ESTIMATE AT T 300

COST ELEMENT	STD. HRS	T 300 HRS	DOLLARS
FACTORY LABOR			
LAYUP	5.08	21.35	213.47
HONEYCOMB CORE PREP	0.0	0.0	0.0
PART CONSOLIDATION	1.42	6.37	63.65
FINISHING OPERATIONS	0.29	1.27	12.75
TOTAL FACTORY LABOR	6.79	28.99	289.87
SUPPORT LABORS			
QUALITY CONTROL		4.07	40.70
TOOLING		3.74	37.39
MFG ENGINEERING		5.85	58.46
ENGINEERING		2.44	24.44
GRAPHIC SERVICES		0.59	5.87
TOTAL SUPPORT LABOR			166.87
LABOR OVERHEAD			
FACTORY LABOR			434.80
QUALITY CONTROL			61.05
TOOLING			56.08
MFG ENGINEERING			87.69
ENGINEERING			41.54
GRAPHIC SERVICES			9.99
TOTAL OVERHEAD			691.16
TOTAL LABOR			1147.90
MATERIAL			
PRODUCTION MATERIAL			170.49
SUPPORT MATERIAL			51.15
MFG. ALLOWANCE			40.00
OVERHEAD			52.33
TOTAL MATERIAL			313.96
ADMINISTRATIVE OVERHEAD			219.26
TOTAL COST			1681.14
			**********

	WEIGHT
LAYUP	5.20
HONEYCOMB CORE PREP	0.0
TOTAL	5.20

COST PROJECTION

CUMULATIVE COST ESTIMATE AT T 300

COST ELEMENT	STD. HRS	T 300 HRS	DOLLARS
FACTORY LABOR			
LAYUP	5.08	6404.13	64041.29
HONEYCOMB CORE PREP	0.0	0.0	0.0
PART CONSOLIDATION	1.42	1909.51	19095.06
FINISHING OPERATIONS	0.29	382.46	3824.59
TOTAL FACTORY LABOR	6.79	8696.09	86960.87
SUPPORT LABORS			
QUALITY CONTROL		1221.08	12210.79
TOOLING		1121.64	11216.37
MFG ENGINEERING		1753.89	17539.93
ENGINEERING		733.14	7331.37
GRAPHIC SERVICES		176.21	1762.10
TOTAL SUPPORT LABOR			50059.58
LABOR OVERHEAD			
FACTORY LABOR			130441.31
QUALITY CONTROL			18316.18
TOOLING			16824.55
MFG ENGINEERING			26308.39
ENGINEERING			12463.32
GRAPHIC SERVICES			2995.57
TOTAL OVERHEAD			207349.19
TOTAL LABOR			344369.56
MATERIAL			
PRODUCTION MATERIAL			51146.62
SUPPORT MATERIAL			15343.98
MFG. ALLOWANCE			1773.42
OVERHEAD			13652.79
TOTAL MATERIAL			81916.69
ADMINISTRATIVE OVERHEAD			63942.93
TOTAL COST			490229.12
			**********

	WEIGHT
LAYUP	1559.52
HONEYCOMB CORE PREP	0.0
TOTAL	1559.52

COST PROJECTION

PRODUCTION COST ESTIMATE AT UNIT NO.: 300
AVERAGE LOT SIZE: 30.
LINEAR UNIT CURVE

PROJECTION FACTORS	T1.VAR	CURVE SLOPE
LAYUP	21.50	78.00 %
HONEYCOMB CORE PREP	23.75	85.00 %
PART CONSOLIDATION	25.00	80.00 %
FINISHING OPERATIONS	21.00	78.00 %

LABOR RATES	$/HR
FACTORY LABOR	7.50
QUALITY CONTROL	6.00
TOOLING	6.00
MFG ENGINEERING	6.00
ENGINEERING	12.00
GRAPHIC SERVICES	9.00

SUPPORT FUNCTIONS	BASE		FACTORS
QUALITY CONTROL	1	1	0.15
TOOLING	1	1	0.15
MFG ENGINEERING	3	1	0.50
ENGINEERING	1	1	0.20
GRAPHIC SERVICES	5	1	0.10
SUPPORT MATERIAL	1	1	3.00

OVERHEAD RATES	
FACTORY LABOR	1.700
QUALITY CONTROL	1.500
TOOLING	1.500
MFG ENGINEERING	1.500
ENGINEERING	1.900
GRAPHIC SERVICES	1.900
MATERIAL	0.250
ADMINISTRATIVE	0.050

COST PROJECTION

UNIT COST ESTIMATE AT T 300

COST ELEMENT	STD. HRS	T 300 HRS	DOLLARS
FACTORY LABOR			
LAYUP	5.08	14.13	105.98
HONEYCOMB CORE PREP	0.0	0.0	0.0
PART CONSOLIDATION	1.42	5.65	33.88
FINISHING OPERATIONS	0.29	0.79	4.77
TOTAL FACTORY LABOR	6.79	20.57	246.86
SUPPORT LABORS			
QUALITY CONTROL		3.09	18.51
TOOLING		3.09	18.51
MFG ENGINEERING		1.54	9.26
ENGINEERING		4.11	49.37
GRAPHIC SERVICES		0.41	3.70
TOTAL SUPPORT LABOR			99.36
LABOR OVERHEAD			
FACTORY LABOR			419.65
QUALITY CONTROL			27.77
TOOLING			27.77
MFG ENGINEERING			13.89
ENGINEERING			93.81
GRAPHIC SERVICES			7.04
TOTAL OVERHEAD			589.92
TOTAL LABOR			936.14
MATERIAL			
PRODUCTION MATERIAL			170.49
SUPPORT MATERIAL			61.71
MFG. ALLOWANCE			39.14
OVERHEAD			67.84
TOTAL MATERIAL			339.18
ADMINISTRATIVE OVERHEAD			63.77
TOTAL COST			1339.06
			**********

	WEIGHT
LAYUP	5.20
HONEYCOMB CORE PREP	0.0
TOTAL	5.20

COST PROJECTION

CUMULATIVE AVERAGE COST ESTIMATE AT T 300

COST ELEMENT	STD. HRS	T 300 HRS	DOLLARS
FACTORY LABOR			
LAYUP	5.08	21.67	162.55
HONEYCOMB CORE PREP	0.0	0.0	0.0
PART CONSOLIDATION	1.42	8.22	49.35
FINISHING OPERATIONS	0.29	1.22	7.31
TOTAL FACTORY LABOR	6.79	31.12	373.40
SUPPORT LABORS			
QUALITY CONTROL		4.67	28.00
TOOLING		4.67	28.00
MFG ENGINEERING		2.33	14.00
ENGINEERING		6.22	74.68
GRAPHIC SERVICES		0.62	5.60
TOTAL SUPPORT LABOR			150.29
LABOR OVERHEAD			
FACTORY LABOR			634.77
QUALITY CONTROL			42.01
TOOLING			42.01
MFG ENGINEERING			21.00
ENGINEERING			141.85
GRAPHIC SERVICES			10.64
TOTAL OVERHEAD			892.32
TOTAL LABOR			1416.01
MATERIAL			
PRODUCTION MATERIAL			170.49
SUPPORT MATERIAL			93.35
MFG. ALLOWANCE			41.67
OVERHEAD			76.38
TOTAL MATERIAL			381.89
ADMINISTRATIVE OVERHEAD			89.89
TOTAL COST			1887.79
			*** .*****

	WEIGHT
LAYUP	5.20
HONEYCOMB CORE PREP	0.0
TOTAL	5.20

COST PROJECTION

CUMULATIVE COST ESTIMATE AT T 300

COST ELEMENT	STD. HRS	T 300 HRS	DOLLARS
FACTORY LABOR			
LAYUP	5.08	6502.14	48766.02
HONEYCOMB CORE PREP	0.0	0.0	0.0
PART CONSOLIDATION	1.42	2467.27	14803.61
FINISHING OPERATIONS	0.29	365.53	2193.16
TOTAL FACTORY LABOR	6.79	9334.93	112019.06
SUPPORT LABORS			
QUALITY CONTROL		1400.24	8401.43
TOOLING		1400.24	8401.43
MFG ENGINEERING		700.12	4200.71
ENGINEERING		1866.98	22403.82
GRAPHIC SERVICES		166.70	1660.29
TOTAL SUPPORT LABOR			45087.68
LABOR OVERHEAD			
FACTORY LABOR			190432.37
QUALITY CONTROL			12602.14
TOOLING			12602.14
MFG ENGINEERING			6301.07
ENGINEERING			42567.24
GRAPHIC SERVICES			3192.54
TOTAL OVERHEAD			267697.37
TOTAL LABOR			424804.06
MATERIAL			
PRODUCTION MATERIAL			51146.62
SUPPORT MATERIAL			28004.78
MFG. ALLOWANCE			2274.58
OVERHEAD			20356.40
TOTAL MATERIAL			101782.37
ADMINISTRATIVE OVERHEAD			26329.32
TOTAL COST			552915.75
			**********

	WEIGHT
LAYUP	1559.52
HONEYCOMB CORE PREP	0.0
TOTAL	1559.52

☆ U. S. GOVERNMENT PRINTING OFFICE: 1977 — 757-001/258